

HRS DOCUMENTATION RECORD -- REVIEW COVER SHEET

Site Name: Ryeland Road Arsenic

EPA ID No: PAD981033459

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Pathways, Components, or Threats Not Scored

The air migration pathway, ground water to surface water component of the surface water migration pathway, drinking water threat for the surface water migration pathway, and nearby population threat for the soil exposure pathway were not scored in this Hazard Ranking System (HRS) scoring package. These pathways and components are not expected to contribute significantly to the overall site score.

HRS DOCUMENTATION RECORD

Date of Record: January 26, 2004

Site Name: Ryeland Road Arsenic

EPA Region: 3

Street Address of Site: Ryeland Road (0.25 mile east of S. Water Street/Bethany Road), Heidelberg Township, Pennsylvania 19567*

County and State: Berks County, Pennsylvania

General Location in the State: Southeast

Topographic Maps: 7.5-Minute Series Topographic Map of Womelsdorf, Pennsylvania, Quadrangle

Latitude: 40°21'14.22"N **Longitude:** 76° 10'31.296"W

Coordinates were measured at the point shown on Figure 1 in the appendix (Refs. 3; 64).

* The site is located in Heidelberg Township; however, the mailing address is Womelsdorf (Borough).

Pathway Scores

Ground Water Pathway	100
Surface Water Pathway	64.27
Soil Exposure Pathway	20.40
Air Pathway	Not Scored (NS)

HRS SITE SCORE 60.30

WORKSHEET FOR COMPUTING HRS SITE SCORE

	<u>S</u>	<u>S²</u>
1. Ground Water Migration Pathway Score (S _{gw}) (from Table 3-1, line 13)	100	10,000
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	64.27	4130.63
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	NS
2c. Surface Water Migration Pathway Score (S _{sw}) Enter the larger of lines 2a and 2b as the pathway score.	64.27	4130.63
3. Soil Exposure Pathway Score (S _s) (from Table 5-1, line 22)	20.40	416.16
4. Air Migration Pathway Score (S _a) (from Table 6-1, line 12)	NS	NS

5. Total of S _{gw} ² + S _{sw} ² + S _s ² + S _a ²		14,546.79
6. HRS Site Score: Divide the value on line 5 by four and take the square root.		60.30

TABLE 3-1
GROUND WATER MIGRATION PATHWAY SCORESHEET

<u>Factor Categories and Factors</u>		<u>Maximum Value</u>	<u>Value Assigned</u>
<u>Likelihood of Release</u>			
1.	Observed Release	550	<u>550</u>
2.	Potential to Release		
2a.	Containment	10	<u>----</u>
2b.	Net Precipitation	10	<u>----</u>
2c.	Depth to Aquifer	5	<u>----</u>
2d.	Travel Time	35	<u>----</u>
2e.	Potential to Release (lines 2a[2b+2c+2d])	500	<u>----</u>
3.	Likelihood of Release (higher of lines 1 and 2e)	550	<u>550</u>
<u>Waste Characteristics</u>			
4.	Toxicity/Mobility	(a)	<u>10,000</u>
5.	Hazardous Waste Quantity	(a)	<u>100</u>
6.	Waste Characteristics	100	<u>32</u>
<u>Targets</u>			
7.	Nearest Well	50	<u>50</u>
8.	Population		
8a.	Level I Concentrations	(b)	<u>150</u>
8b.	Level II Concentrations	(b)	<u>7</u>
8c.	Potential Contamination	(b)	<u>405</u>
8d.	Population (lines 8a+8b+8c)	(b)	<u>562</u>
9.	Resources	5	<u>0</u>
10.	Wellhead Protection Area	20	<u>0</u>
11.	Targets (lines 7+8d+9+10)	(b)	<u>612</u>
<u>Ground Water Migration Score for an Aquifer:</u>			
12.	Aquifer Score ([lines 3 x 6 x 11]/82,500) ^c	100	<u>100</u>
<u>Ground Water Migration Pathway Score:</u>			
13.	Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100	<u>100</u>
a	Maximum value applies to waste characteristics category.		
b	Maximum value is not applicable.		
c	Do not round to nearest integer.		

TABLE 4-1
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

<u>Factor Categories and Factors</u>	<u>Maximum Value</u>	<u>Value Assigned</u>
Drinking Water Threat		
<u>Likelihood of Release</u>		
1. Observed Release	550	<u>550</u>
2. Potential to Release by Overland Flow		
2a. Containment	10	<u>---</u>
2b. Runoff	25	<u>---</u>
2c. Distance to Surface Water	25	<u>---</u>
2d. Potential to Release by Overland Flow (lines 2a[2b +2c])	500	<u>---</u>
3. Potential to Release by Flood		
3a. Containment (Flood)	10	<u>---</u>
3b. Flood Frequency	50	<u>---</u>
3c. Potential to Release by Flood (lines 3a x 3b)	500	<u>---</u>
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	<u>---</u>
5. Likelihood of Release (higher of lines 1 and 4)	550	<u>550</u>
<u>Waste Characteristics</u>		
6. Toxicity/Persistence	(a)	<u>---</u>
7. Hazardous Waste Quantity	(a)	<u>---</u>
8. Waste Characteristics	100	<u>---</u>
<u>Targets</u>		
9. Nearest Intake	50	<u>---</u>
10. Population		
10a. Level I Concentrations	(b)	<u>---</u>
10b. Level II Concentrations	(b)	<u>---</u>
10c. Potential Contamination	(b)	<u>---</u>
10d. Population (lines 10a + 10b + 10c)	(b)	<u>---</u>
11. Resources	5	<u>---</u>
12. Targets (lines 9 + 10d + 11)	(b)	<u>---</u>
<u>Drinking Water Threat Score</u>		
13. Drinking Water Threat Score ([lines 5 x 8 x 12]/82,500, subject to a maximum of 100)	100	<u>0</u>

^a Maximum value applies to waste characteristics category.

^b Maximum value is not applicable.

^c Do not round to nearest integer.

TABLE 4-1 (Continued)
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

<u>Factor Categories and Factors</u>	<u>Maximum Value</u>	<u>Value Assigned</u>
Human Food Chain Threat		
<u>Likelihood of Release</u>		
14. Likelihood of Release (same value as line 5)	550	<u>550</u>
<u>Waste Characteristics</u>		
15. Toxicity/Persistence/Bioaccumulation	(a)	<u>5 x 10⁴</u>
16. Hazardous Waste Quantity	(a)	<u>100</u>
17. Waste Characteristics	1,000	<u>32</u>
<u>Targets</u>		
18. Food Chain Individual	50	<u>20</u>
19. Population		
19a. Level I Concentrations	(b)	<u>0</u>
19b. Level II Concentrations	(b)	<u>0</u>
19c. Potential Human Food Chain Contamination	(b)	<u>0.0006</u>
19d. Population (lines 19a + 19b + 19c)	(b)	<u>0.0006</u>
20. Targets (lines 18 + 19d)	(b)	<u>20.0006</u>
<u>Human Food Chain Threat Score</u>		
21. Human Food Chain Threat Score ([lines 14 x 17 x 20]/82,500, subject to a maximum of 100)	100	<u>4.27</u>

^a Maximum value applies to waste characteristics category.

^b Maximum value is not applicable.

^c Do not round to nearest integer.

TABLE 4-1 (Continued)
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

<u>Factor Categories and Factors</u>		<u>Maximum Value</u>	<u>Value Assigned</u>
Environmental Threat			
<u>Likelihood of Release</u>			
22.	Likelihood of Release (same value as line 5)	550	<u>550</u>
<u>Waste Characteristics</u>			
23.	Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	<u>5×10^7</u>
24.	Hazardous Waste Quantity	(a)	<u>100</u>
25.	Waste Characteristics	1,000	<u>180</u>
<u>Targets</u>			
26.	Sensitive Environments		
26a.	Level I Concentrations	(b)	<u>0</u>
26b.	Level II Concentrations	(b)	<u>100</u>
26c.	Potential Contamination	(b)	<u>1.75</u>
26d.	Sensitive Environments (lines 26a + 26b + 26c)	(b)	<u>101.75</u>
27.	Targets (value from line 26d)	(b)	<u>101.75</u>
<u>Environmental Threat Score</u>			
28.	Environmental Threat Score ([lines 22 x 25 x 27]/82,500, subject to a maximum of 60)	60	<u>60</u>
<u>Surface Water Overland/Flood Migration Component Score for a Watershed</u>			
29.	Watershed Score ^c (lines 13 + 21 + 28, subject to a maximum of 100)	100	<u>64.27</u>
<u>Surface Water Overland/Flood Migration Component Score</u>			
30.	Component Score (S_{of}) ^c (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100	<u>64.27</u>

^a Maximum value applies to waste characteristics category.

^b Maximum value is not applicable.

^c Do not round to nearest integer.

TABLE 5-1
SOIL EXPOSURE PATHWAY SCORESHEET

<u>Factor Categories and Factors</u>	<u>Maximum Value</u>	<u>Value Assigned</u>
Resident Population Threat		
<u>Likelihood of Release</u>		
1. Observed Release	550	<u>550</u>
<u>Waste Characteristics</u>		
2. Toxicity	(a)	<u>10,000</u>
3. Hazardous Waste Quantity	(a)	<u>10</u>
4. Waste Characteristics	100	<u>18</u>
<u>Targets</u>		
5. Resident Individual	50	<u>50</u>
6. Resident Population		
6a. Level I Concentrations	(b)	<u>120</u>
6b. Level II Concentrations	(b)	<u>0</u>
6c. Resident Population	(b)	<u>120</u>
(Lines 6a + 6b)		
7. Workers	15	<u>0</u>
8. Resources	5	<u>0</u>
9. Terrestrial Sensitive Environments	(c)	<u>0</u>
1. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)	<u>170</u>
<u>Resident Population Threat Score</u>		
2. Resident Population Threat Score (Lines 1 x 4 x 10)	(b)	<u>1,683,000</u>

^a Maximum value applies to waste characteristics category.

^b Maximum value is not applicable.

^c Do not round to nearest integer.

TABLE 5-1 (Continued)
SOIL EXPOSURE PATHWAY SCORESHEET

<u>Factor Categories and Factors</u>	<u>Maximum Value</u>	<u>Value Assigned</u>
Nearby Population Threat		
<u>Likelihood of Exposure</u>		
3. Attractiveness/Accessibility	100	---
4. Area of Contamination	100	---
5. Likelihood of Exposure	500	---
6.		
<u>Waste Characteristics</u>		
7. Toxicity	(a)	---
8. Hazardous Waste Quantity	(a)	---
9. Waste Characteristics	100	---
<u>Targets</u>		
10. Nearby Individual	1	---
11. Population Within 1 Mile	(b)	---
12. Targets (lines 18 + 19)	(b)	---
<u>Nearby Population Threat Score</u>		
13. Nearby Population Threat Score (lines 14 x 17 x 20)	(b)	---
<u>Soil Exposure Pathway Scores</u>		
22. Soil Exposure Score ([lines 11 + 21]/82,500, subject to a maximum of 100)	100	<u>20.40</u>

- ^a Maximum value applies to waste characteristics category.
- ^b Maximum value is not applicable.
- ^c Do not round to nearest integer.

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ACRONYMS AND ABBREVIATIONS

: g/l	Microgram per liter
ACC	Allegheny Chemical Company
ATSDR	Agency for Toxic Substances and Disease Registry
BCH	Bethany Childrens Home
bgs	Below ground surface
BPFV	Bioaccumulation potential factor value
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CRDL	Contract-required detection limit
EPA	U.S. Environmental Protection Agency
ESI	Expanded site inspection
ft ²	Square feet
ft ³ /sec	Cubic feet per second
GPS	Global positioning system
GW	Ground water
HRS	Hazard Ranking System
HWQ	Hazardous Waste Quantity
MCL	Maximum contaminant level
MDL	Method detection limit
mg/kg	Milligram per kilogram
NA	Not applicable
ND	Not detected
NQL	Nominal quantitation limit
NS	Not scored
NWA	Newmanstown Water Authority
OASQA	Office of Analytical Services and Quality Assurance
PA	Preliminary Assessment
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PAGWIS	Pennsylvania Groundwater Information System
PPE	Probable point of entry
PVC	Poly vinyl chloride
RBC	Risk-based concentration
RBWA	Richland Borough Water Authority
RLS	Reporting Limits
START	Superfund Technical Assessment and Response Team (EPA contractor)
SCWC	Standard Chemical Works Corporation
SCDM	Superfund Chemical Data Matrix
SI	Site inspection

SD	Sediment
SQL	Sample quantitation limit
TDL	Target distance limit
USFWS	U.S. Fish and Wildlife Service
yd ³	Cubic yard

INTRODUCTION

The Ryeland Road Arsenic site, located in Heidelberg Township (just outside the Borough of Womelsdorf), Berks County, Pennsylvania, encompasses approximately 7.33 acres as shown in Figures 1 and 2 in the appendix (Ref. 4, p. 2). A portion of the site is the former location of the Standard Chemical Works Corporation (SCWC), and subsequently Allegheny Chemical Corporation (ACC). The SCWC and the ACC property consisted of land located on the northern and southern sides of Ryeland Road. The former SCWC and ACC property on the northern side of Ryeland Road has since been subdivided into four contiguous parcels of land (residential properties), which are bordered to the north by railroad tracks, to the east and west by residential homes, and to the south by Ryeland Road. The former SCWC and ACC property on the southern side of Ryeland Road has remained a vacant lot and is bordered to the north by Ryeland Road, to the east and west by residential homes, and to the south by a wooded area. A children's orphanage, Bethany Children's Home, is located on the south side of Ryeland Road, west of the site. A spring-fed creek and a spring-fed pond are situated north of the railroad tracks (Ref. 4, pp. 2 and 3).

From 1920 to 1940, SCWC, and subsequently ACC, manufactured pesticides, paints, varnishes, and sulfuric acid (Ref. 5, p. 1). The manufacturing building was located on the north side of Ryeland Road. As part of the pesticide manufacturing process, arsenic was converted to arsenic acid; by-products included lead arsenate, calcium arsenate, and copper acetoarsenate (Ref. 5, p. 1). Wastes generated during the manufacturing process were reportedly disposed of on a parcel of land on the south side of Ryeland Road across the street from the facility and on the facility property itself (Ref. 6, p. 8). After shutdown of the facility and demolition of the building, the facility property was subdivided into four parcels, which now each contain a residence (Ref. 5, p. 1). The area reportedly used by the facility for waste disposal is located on an undeveloped parcel the south side of Ryeland Road (Ref. 4, p. 2). Figure 2 in the appendix shows the former location of the facility building and the reported waste disposal area.

In October 1983, a resident near the former pesticide facility notified the Pennsylvania Department of Environmental Resources (PADER) of the presence of whitish material along Ryeland Road. PADER collected two samples of the grayish-white material: one from a waste pile on the south side of Ryeland Road and one from an area on the north side of Ryeland Road. The waste pile on the south side of Ryeland Road was reportedly 75 to 100 feet in diameter. The property has since been graded and the estimated affected area is approximately 30 by 20 yards. The visibly affected area on the north side of Ryeland Road was approximately 20 by 6 feet. PADER estimated the actual volume of contaminated soil to be larger because of contamination beneath the ground surface. The analytical results of the samples

collected by PADER revealed the presence of total arsenic and lead at concentrations of 5,666 and 2,900 milligrams per kilogram (mg/kg), respectively (Ref. 5, pp. 1, 2, 4, and 5).

In 1984, PADER conducted a preliminary assessment (PA) of the former pesticide facility, which led to a site inspection (SI) conducted in March 1985. Ground water, surface water, sediment, and waste pile samples were collected as part of the SI. Analytical results of ground water samples collected from residential wells documented arsenic, copper, and lead concentrations below corresponding drinking water standards. A sample collected from a spring located north of the disposal areas contained 535 micrograms per liter (: g/L) of arsenic (Ref. 5, p. 2). A composite sample collected from the waste pile located on the north side of Ryeland Road revealed the presence of arsenic and lead at concentrations of 5,200 and 1,260 mg/kg, respectively. A composite sample collected from the waste pile located on the south side of Ryeland Road revealed arsenic and lead concentrations of 4,600 and 258 mg/kg, respectively (Ref. 7, p. 1-4).

In response to the levels of arsenic and lead found in the waste piles and the proximity of the waste piles to residential homes, the U.S. Environmental Protection Agency (EPA) conducted a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action at the site from August 1985 to November 1989. During a two-phased removal action, approximately 5,400 cubic yards (yd³) of waste material and contaminated soil were removed from the north and south sides of Ryeland Road and disposed of at an off-site location. Contaminated soil was excavated to a depth of 2 feet below ground surface (bgs) during Phase II of the removal. Further sampling indicated that contaminated soil extended onto property owned by Conrail. EPA notified Conrail regarding the presence of contaminated soil on their property. No action was taken by Conrail (Ref 6, pp. 18 and 19).

In July 2001, the property owner of the parcel on the south side of Ryeland Road excavated and graded his property in order to build a home. EPA was notified of the activities and subsequently conducted an extent of contamination study. The study identified contaminated soil from 0 to 9 feet bgs containing up to 26,000 and 36,000 mg/kg of arsenic and lead, respectively. EPA reactivated the CERCLA removal action that was initiated in 1985 and removed the stockpiled soil excavated by the property owner. Additionally, EPA excavated and removed 2 feet of soil from nonvegetated areas of the southern parcel. Approximately 4,470 tons of contaminated soil were removed and disposed of at an off-site location. Arsenic- and lead-contaminated surface soils, as delineated by sampling conducted during the removal action, were not removed from heavily vegetated areas on site (Ref. 4, pp. 4-6 and Appendix A, Figure 3).

In November 2001, START collected ground water samples from five private domestic drinking water wells on Ryeland Road near the pesticide facility's former disposal areas. Analysis of the samples for total metals revealed concentrations of lead above EPA's national primary drinking water action level of 15 µg/L set under the Safe Drinking Water Act (Ref. 4, p. 5). EPA provided the five residences with bottled water for consumption from approximately the summer to the fall of 2002. Subsequent to fall of 2002, analytical results of additional samples collected from these homes for dissolved metals did not reveal the presence of lead above the action level (Ref. 41).

In March 2002, EPA directed START to conduct an expanded site inspection (ESI) of the Ryeland Road Arsenic site. Activities included the collection of ground water, surface water, sediment, and surface soil samples. Samples collected from domestic drinking water wells revealed the presence of copper at concentrations ranging from 40 to 1,030 µg/L. Copper was not detected in the background ground water sample. Concentrations of lead detected in the domestic drinking well samples ranged from 4 to 190 µg/L (Ref. 4, p. 19 and Attachment pp. 182-186). Analytical results for all downstream sediment samples indicated the presence of arsenic at concentrations ranging from 26.3 to 407 mg/kg, exceeding three times the concentration of arsenic detected in a sample collected upstream. One downstream sediment sample contained concentrations of copper and lead exceeding three times the upstream concentrations (Ref. 4, p. 23).

XRF analysis of surface soil samples collected from the residential parcels on the north side of Ryeland Road contained concentrations of arsenic up to 2,100 mg/kg. As part of the ongoing removal action, EPA excavated, removed, and disposed of 2 feet of contaminated soil off site from the two western most parcels (parcels A and B on Figure 2 in the appendix of this HRS documentation record) of the former pesticide facility on the north side of Ryeland Road (Ref. 4, pp. 6 and 7 and Appendix A, Figure 3). Soil samples collected from test trenches dug on the north side of Ryeland Road during the removal action documented that arsenic-contaminated soil was present at depths ranging from 0 to 7 feet bgs at concentrations up to 44,000 mg/kg (Ref. 4, p. 7). Although arsenic contamination was identified in soil on the residential property adjacent to the west side of the former pesticide facility (west of parcel A on Figure 2 in the appendix) on the north side of Ryeland Road, the owner of the property declined to have EPA remove the contaminated soil (Ref. 8, Logbook 3, pp. 19 and 20).

As part of the removal action in August 2002, soil samples were collected from the two eastern most parcels (parcels C and D on Figure 2 in the appendix) of the former pesticide facility on the north side of Ryeland Road. Analytical results revealed levels of arsenic in the surface soils above 30 mg/kg, the site-

specific action level established by EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) (Ref. 4, pp. 6, 7).

The source areas being evaluated as part of this HRS scoring package are the remaining contaminated soils not excavated during previous EPA removal actions, which include surface soil in heavily vegetated areas of the former pesticide disposal area on the south side of Ryeland Road, surface soil on the residential property adjacent to the west side of the former pesticide facility on the north side of Ryeland Road, and surface soil on the two eastern-most parcels of the former pesticide facility (Ref. 4, Appendix A, Figure 3). No other potential sources of arsenic, copper, and lead have been identified in the area of the site.

2.2 Source Characterization

Source Number: 1

Source Description: Contaminated Soil/West of Former Pesticide Facility

Source Type: Contaminated Soil

From approximately 1920 to 1940, a pesticide manufacturing facility was located on the north side of Ryeland Road. The facility manufactured a pesticide that contained arsenic acid. By-products of the arsenic acid manufacturing process included lead arsenate, calcium arsenate, and possibly copper acetoarsenate (Ref. 5, p. 1). Wastes generated during the manufacturing process, which included arsenic, copper, and lead compounds, were reportedly disposed of around the facility property on the north side of Ryeland Road and on a parcel of land located on the south side of Ryeland Road, southeast of the former facility (Ref. 6, p. 8). Subsequent sampling and analysis of soils located in these areas has identified elevated levels of arsenic and lead.

Source 1 is a 3,313- square feet (ft²) area of contaminated soil located to the west of the former pesticide facility (see Figures 3 and 4 in the appendix) (Ref. 13). The boundaries of Source 1 are defined by analytical results of soil samples collected in this area that document concentrations of arsenic and lead elevated above background levels (Refs. 9; 10, pp. 2-4; 11; 12, pp. 0004 and 0015; 38; 39, p. 12).

Source Location:

Source 1 is located on two parcels of land on the north side of Ryeland Road west of the former pesticide facility, as shown in Figures 3 and 4 in the appendix. A portion of Source 1 is located on a residential property and within 200 of the residence on that property, as indicated in Figure 4 in the appendix.

Containment:

Release to Ground Water: There is no evidence that a maintained engineered cover or functioning and maintained runoff control system and runoff management system was in place at Source 1; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 3-2).

Release via overland migration and/or flood: There is no evidence that a maintained engineered cover or functioning and maintained runoff control system and runoff management system was in place at Source 1; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 4-2).

SD - Characterization and Containment
Source No.: 1

Gas Release to Air: The air migration pathway was not scored.

Particulate Release to Air: The air migration pathway was not scored.

2.4.1 Hazardous Substances

Evidence that hazardous substances are present at Source 1 is documented by the laboratory analysis of soil samples collected at depths ranging from 0 to 12 inches bgs during the 2001-2002 EPA removal action (Refs. 8, Logbook 1, pp. 125 and 126, Logbook 2, pp. 123 and 124; 10, pp. 8 and 9; 11, p. 0008; and 39, p. 4). The soil type of Source 1 is mapped as Clarksburg silt loam. The Clarksburg soil series is characterized as very deep, moderately well drained soil that formed in fine-loamy colluvium weathered from limestone, siltstone, and shale. The Clarksburg soil series contains 1 to 3 percent organic matter in the surface layer (Ref. 65). No background soil samples were collected during the removal action. To establish background concentrations of metals in the vicinity of the site, five background soil samples were collected during the 2002 ESI, at depths ranging from 0 to 24 inches bgs (Ref. 4, p. 12 and Attachment, p. 28; 23, pp. 49-51). The soil type of the background soil samples is mapped as Laidig gravelly loam. The Laidig soil series is characterized as very deep, well drained soils that formed in fine-loamy colluvium weathered from sandstone and siltstone. The Laidig soil series contains 2 to 4 percent organic matter in the surface layer (Ref. 65).

Arsenic concentrations detected in the ESI background samples ranged from 3.3 to 6.7 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). According to published data, the observed range of arsenic concentrations in the eastern United States is from <0.1 to 73 mg/kg with an estimated mean of 7.4 mg/kg (Ref. 40, p. 10). Lead concentrations detected in the ESI background samples ranged from 6.4 to 156 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). The observed range of lead concentrations in the eastern United States is from <10 to 300 mg/kg with an estimated mean of 17 mg/kg (Ref. 40, p. 10). The background samples containing the highest concentrations for arsenic and lead, RESI-BGSS-05 and RESI-BGSS-04, respectively, were used to determine the significance of the concentrations of these metals detected in Source 1 (Ref. 4, Attachment, pp. 10, 11, 57 and 58). The ESI background sampling locations are shown in Figure 3 in the appendix. Source 1 sampling locations are shown in Figure 4 in the appendix. The source sample analytical results were reviewed and validated in accordance with EPA Quality Assurance/Quality Control Guidance for Removal Activities, EPA/540/4-90/004, April 1990 (Ref. 9; Ref. 11; Ref. 38). The background samples were collected, analyzed, and validated according to EPA Contract Laboratory Program (CLP) protocols (Ref. 4, p. 12 and Attachment, pp. 2-6).

2.4.1 Hazardous Substances (continued)

Hazardous Substance	Evidence	Sample Concentration (mg/kg)	Background Concentration RESI-BGSS-04 RESI-BGSS-05 (mg/kg)	RLs/ Detection Limit* (mg/kg)	Reference
Metals					
Arsenic	RR-SS-81	42.2J	6.7K	0.583	9; 10, p. 2
	RR-SS-82	34.2J	6.7K	0.622	9; 10, p. 2
	RR-SS-86	24.8J	6.7K	0.558	9; 10, p. 3
	RR-SS-87	29.8J	6.7K	0.599	9; 10, p. 3
	RR-SS-88	20.3J	6.7K	0.615	9; 10, p. 4
	RR-SS-181	22	6.7K	2	38; 39, p. 12
Lead	RR-SS-93	870	156	2	11; 12, p. 0004 and 0015

* The laboratory adjusted the data for percent solids to determine the method detection limit/reporting limit; therefore, the laboratory method detection limit/reporting limit is equivalent to the sample quantitation limit (Ref. 10; Ref. 12; Ref. 39).

J Analyte present. Reported value may not be accurate or precise. The direction of the bias, high or low, can not be determined. Data qualified because criteria for serial dilution and matrix spike recoveries were not met.

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

mg/kg Milligrams per kilogram

RLs Laboratory reporting limit

SD - Hazardous Waste Quantity Value
Source No.: 1

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Source 1.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

2.4.2.1.2 Hazardous Waste Stream Quantity

<u>Hazardous Waste Stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous waste stream for Source 1.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

The information available is not sufficient to adequately evaluate the volume for Source 1.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

2.4.2.1.4 Area

The area of Source 1 is delineated by the elevated concentrations of arsenic and lead detected in the soil samples documented in Section 2.4.1. This area is approximately 3,313 ft², as shown in Figure 4 in the appendix (Ref. 13). Each sampling location was recorded using global positioning system (GPS) coordinates (Ref. 42). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background into the Arcview 3.2 computer program. The area of Source 1 (as shown in Figure 4 in the appendix) was then calculated in Arcview 3.2 by measuring the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt to give a conservative estimate since contamination is not known to exist beneath such surfaces (Ref. 13).

Area of Source (ft²): 3,313

Area Assigned Value (Ref. 1, Table 2-5): 3,313/34,000 = 0.1

SD - Hazardous Waste Quantity Value
Source No.: 1

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value is assigned the value of the area of Source 1.

Source Hazardous Waste Quantity Value: 0.1

2.2 Source Characterization

Source Number: 2

Source Description: Contaminated Soil/Former Pesticide Facility

Source Type: Contaminated Soil

From approximately 1920 to 1940, a pesticide manufacturing facility was located on the north side of Ryeland Road. The facility manufactured a pesticide that contained arsenic acid. By-products of the arsenic acid manufacturing process included lead arsenate, calcium arsenate, and possibly copper acetoarsenate (Ref. 5, p.1). Wastes generated during the manufacturing process, which included arsenic, copper, and lead compounds, were reportedly disposed of around the facility property on the north side of Ryeland Road and on a parcel of land located on the south side of Ryeland Road, southeast of the former facility (Ref. 6, p. 8). Subsequent sampling and analysis of soils located in these areas has identified elevated levels of arsenic, copper, and lead.

Source 2 is a 31,389-ft² area of contaminated soil located on the former pesticide facility (parcels B, C, and D, as shown in Figures 2 and 3 in the appendix) (Ref. 13). The boundaries of Source 2 are defined by analytical results of soil samples collected in this area that document concentrations of arsenic, copper, and lead above background levels (Refs. 4, Attachment, pp. 11, 21, 24, 61, 62, 130-140, 142, 144, 147, 148, 161-163, and 165; 14; 15, pp. 0006, 0008, 0010, 0014, 0018, 0022, 0024, 0026; 16; 17, pp. 0009, 0011, 0013, 0015, 0017, 0019, 0021, 0023, 0025, 0027, 0029, 0031, 0033, 0035, 0037, 0039, 0041, 0045).

Source Location:

Source 2 is located on the north side of Ryeland Road in the area formerly occupied by the pesticide facility, as shown in Figures 3 and 5 in the appendix. Three residences are located within 200 feet of Source 2, as shown in Figure 5 of the appendix.

Containment:

Release to Ground Water: There is no evidence that a maintained engineered cover or functioning and maintained runoff control system and runoff management system was in place at Source 2; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 3-2).

SD - Characterization and Containment
Source No.: 2

Release via overland migration and/or flood: There is no evidence that a maintained engineered cover or functioning and maintained runoff control system and runoff management system was in place at Source 2; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 4-2).

Gas Release to Air: The air migration pathway was not scored.

Particulate Release to Air: The air migration pathway was not scored.

2.4.1 Hazardous Substances

Evidence that hazardous substances are present at Source 2 is documented by the laboratory analysis of soil samples collected at depths ranging from 0 to 24 inches bgs during the 2001-2002 EPA removal action and the 2002 ESI conducted by START (Refs. 4, Table 1, pp. 10 and 11, Attachment, pp. 28, 34-36; 8, Logbook 3, pp. 11, 12, 16, and 17; 15, p. 0004; 17, pp. 0004 and 0005; and 23, pp. 32, 39-44, 53, and 54).

The soil type of Source 2 is mapped as Clarksburg silt loam. The Clarksburg soil series is characterized as very deep, moderately well drained soil that formed in fine-loamy colluvium weathered from limestone, siltstone, and shale. The Clarksburg soil series contains 1 to 3 percent organic matter in the surface layer (Ref. 65). No background soil samples were collected during the removal action. To establish background concentrations of metals in the vicinity of the site, five background soil samples were collected during the 2002 ESI, at depths ranging from 0 to 24 inches bgs (Ref. 4, p. 12 and Attachment, p. 28; 23, pp. 49-51). The soil type of the background soil samples is mapped as Laidig gravelly loam. The Laidig soil series is characterized as very deep, well drained soils that formed in fine-loamy colluvium weathered from sandstone and siltstone. The Laidig soil series contains 2 to 4 percent organic matter in the surface layer (Ref. 65).

Arsenic concentrations detected in the ESI background samples ranged from 3.3 to 6.7 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). According to published data, the observed range of arsenic concentrations in the eastern United States is from <0.1 to 73 mg/kg with an estimated mean of 7.4 mg/kg (Ref. 40, p. 10). Copper concentrations detected in the ESI background samples ranged from 5.1 to 59 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). The observed range of copper concentrations in the eastern United States is from <1 to 700 mg/kg with an estimated mean of 22 (Ref. 40, p. 10). Lead concentrations detected in the ESI background samples ranged from 6.4 to 156 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). The observed range of lead concentrations in the eastern United States is from <10 to 300 mg/kg with an estimated mean of 17 mg/kg (Ref. 40). The background samples containing the highest concentrations for arsenic, RESI-BGSS-05, and RESI-BGSS-04 for copper and lead, were used to determine the significance of the concentrations of these metals detected in Source 2 (Ref. 4, Attachment, pp. 10, 11, 57 and 58). The ESI background sampling locations are shown in Figure 3 in the appendix. Source 2 sampling locations are shown in Figure 5 in the appendix. The source sample analytical results collected during the 2002 removal action were reviewed and validated in accordance with EPA Quality Assurance/Quality Control Guidance for Removal Activities, EPA/540/4-90/004, April 1990 (Refs. 14; 16). The source and background samples collected during the 2002 ESI were analyzed and validated according to EPA CLP protocols (Ref. 4, p. 12 and Attachment, pp. 2-6).

2.4.1 Hazardous Substances (continued)

Hazardous Substance	Evidence	Sample Concentration (mg/kg)	Background Concentration RESI-BGSS-04 RESI-BGSS-05 (mg/kg)	SQL/ Reporting Limit* (mg/kg)	Reference
Metals					
Arsenic	RESI-SS-29	76.3K	6.7K	2.6	4, Attachment, pp. 21 and 136; 37
	RESI-SS-33	11,300K	6.7K	2.4	4, Attachment, pp. 22 and 140; 37
	RESI-SS-37	589K	6.7K	2.3	4, Attachment, pp. 23 and 144; 37
	RESI-SS-40	33.3K	6.7K	2.5	4, Attachment, pp. 23 and 147; 37
	RESI-SS-41	59K	6.7K	2.3	4, Attachment, pp. 23 and 148; 37
	RESI-SS-45	102	6.7K	2.4	4, Attachment, pp. 24 and 161; 37
	RESI-SS-46	268	6.7K	2.6	4, Attachment, pp. 24 and 162; 37
	RESI-SS-47	78.2	6.7K	2.4	4, Attachment, pp. 25 and 163; 37
	RESI-SS-49	59.1	6.7K	2.6	4, Attachment, pp. 25 and 165; 37
	RESI-DSS-03	81.5K	6.7K	2.7	4, Attachment, pp. 11 and 61; 37
	RESI-DSS-04	82.4K	6.7K	3.4	4, Attachment, pp. 11 and 62; 37
	RR-SS-208	59J	6.7K	1	14; 15, p. 0006
	RR-SS-209	63J	6.7K	0.9	14; 15, p. 0008
	RR-SS-210	51J	6.7K	0.9	14; 15, p. 0010
	RR-SS-212	62J	6.7K	1	14; 15, p. 0014
	RR-SS-214	21J	6.7K	0.9	14; 15, p. 0018
	RR-SS-215	31J	6.7K	1	14; 15, p. 0020
	RR-SS-216	43J	6.7K	1	14; 15, p. 0022
	RR-SS-217	55J	6.7K	0.9	14; 15, p. 0024
	RR-SS-219	79	6.7K	1	16; 17, p. 0009
	RR-SS-220	100	6.7K	1	16; 17, p. 0011
	RR-SS-221	62	6.7K	1	16; 17, p. 0013
	RR-SS-222	220	6.7K	0.9	16; 17, p. 0015
	RR-SS-223	220	6.7K	0.9	16; 17, p. 0017
	RR-SS-224	150	6.7K	0.9	16; 17, p. 0019
	RR-SS-225	120	6.7K	0.9	16; 17, p. 0021
	RR-SS-226	280	6.7K	1	16; 17, p. 0023
	RR-SS-227	95	6.7K	0.8	16; 17, p. 0025
	RR-SS-228	71	6.7K	0.8	16; 17, p. 0027

SD - Hazardous Substances
Source No.: 2

Hazardous Substance	Evidence	Sample Concentration (mg/kg)	Background Concentration RESI-BGSS-04 RESI-BGSS-05 (mg/kg)	SQL/ Reporting Limit* (mg/kg)	Reference
Arsenic	RR-SS-229	90	6.7K	1	16; 17, p. 0029
	RR-SS-230	40	6.7K	1	16; 17, p. 0031
	RR-SS-231	75	6.7K	0.9	16; 17, p. 0033
	RR-SS-232	150	6.7K	0.9	16; 17, p. 0035
	RR-SS-233	120	6.7K	0.8	16; 17, p. 0037
	RR-SS-234	54	6.7K	0.9	16; 17, p. 0039
	RR-SS-235	35	6.7K	0.9	16; 17, p. 0041
	RR-SS-237	27	6.7K	0.9	16; 17, p. 0045
Copper	RESI-SS-33	467J	59	5.92	4, Attachment, pp. 22 and 140; 37
Lead	RESI-SS-33	7,420	156	0.71	4, Attachment, pp. 22 and 140; 37

* For samples analyzed by a non-CLP laboratory, the laboratory adjusted the data for percent solids to determine the reporting limit; therefore, the laboratory reporting limit is equivalent to the SQL (Refs. 15; 17).

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

mg/kg Milligrams per kilogram

SQL Sample quantitation limit (detection limit divided by the percent solids).

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Source 2.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

2.4.2.1.2 Hazardous Waste Stream Quantity

<u>Hazardous Waste Stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous waste stream quantity for Source 2.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

The information available is not sufficient to adequately evaluate the volume for Source 2.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

2.4.2.1.4 Area

The area of Source 2 is delineated by the elevated concentrations of arsenic, copper, and lead detected in the soil samples documented in Section 2.4.1. This area is approximately 31,389 ft², as shown in Figure 5 in the appendix (Ref. 13). Each sampling location was recorded using GPS coordinates (Ref. 42). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background into the Arcview 3.2 computer program. The area of Source 2 (as shown in Figure 5 in the appendix) was then calculated in Arcview 3.2 by measuring the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt to give a conservative estimate since contamination is not known to exist beneath such surfaces (Ref. 13).

Area of Source (ft²): 31,389

Area Assigned Value (Ref. 1, Table 2-5): 31,389/34,000 = 0.92

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value is assigned the value of the area of Source 2.

Source Hazardous Waste Quantity Value: 0.92

2.2 Source Characterization

Source Number: 3

Source Description: Contaminated Soil/Western Edge of Former Pesticide Facility Disposal Area

Source Type: Contaminated Soil

From approximately 1920 to 1940, a pesticide manufacturing facility was located on the north side of Ryeland Road. The facility manufactured a pesticide that contained arsenic acid. By-products of the arsenic acid manufacturing process included lead arsenate, calcium arsenate, and possibly copper acetoarsenate (Ref. 5, p. 1). Wastes generated during the manufacturing process, which included arsenic, copper, and lead compounds, were reportedly disposed of around the facility property and on a parcel of land located on the south side of Ryeland Road, southeast of the former facility (Ref. 6, p. 8). Subsequent sampling and analysis of soils located in these areas has identified elevated levels of arsenic, copper, and lead.

Source 3 is a 3,014-ft² area of contaminated soil located on the reported waste disposal area (see Figures 3 and 6 in the appendix) (Ref. 13). The boundaries of Source 3 are defined by analytical results of soil samples collected in this area that document concentrations of arsenic above background levels (Ref. 18, pp. 25, 28, and 29).

Source Location:

Source 3 is located on the south side of Ryeland Road in the area formerly used by the pesticide manufacturing facility as a disposal area (Ref. 6, p. 8). Source 3 extends west onto a residential property, as shown in Figures 3 and 6 in the appendix. A drainage ditch is located in the center of Source 3 and continues north underneath Ryeland Road to the property formerly occupied by the pesticide facility (Ref. 4, Appendix A, Figure 4).

Containment:

Release to Ground Water: There is no evidence that a maintained engineered cover or functioning and maintained run-on control system and runoff management system was in place at Source 3; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 3-2).

Release via overland migration and/or flood: There is no evidence that a maintained engineered cover or functioning and maintained run-on control system and runoff management system was in place at Source 3; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 4-2).

Gas Release to Air: The air migration pathway was not scored.

Particulate Release to Air: The air migration pathway was not scored.

2.4.1 Hazardous Substances

Evidence that hazardous substances are present at Source 3 is documented by the laboratory analysis of soil samples collected at depths ranging from 0 to 12 inches bgs during the 2001-2002 EPA removal action (Refs. 8, Logbook 1, pp. 59, 63, 64, and 68; 18, pp. 82, 83, 85). The soil types of Source 3 are mapped as Clarksburg silt loam and Laidig gravelly loam. The Clarksburg soil series is characterized as very deep, moderately well drained soil that formed in fine-loamy colluvium weathered from limestone, siltstone, and shale. The Clarksburg soil series contains 1 to 3 percent organic matter in the surface layer. The Laidig soil series is characterized as very deep, well drained soils that formed in fine-loamy colluvium weathered from sandstone and siltstone. The Laidig soil series contains 2 to 4 percent organic matter in the surface layer (Ref. 65). No background soil samples were collected during the removal action. To establish background concentrations of metals in the vicinity of the site, five background soil samples were collected during the 2002 ESI, at depths ranging from 0 to 24 inches bgs (Ref. 4, p. 12 and Attachment, p. 28; 23, pp. 49-51). The soil type of the background soil samples is mapped as Laidig gravelly loam (Ref. 65).

Arsenic concentrations detected in the ESI background samples ranged from 3.3 to 6.7 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). According to published data, the observed range of arsenic concentrations in the eastern United States is from <0.1 to 73 mg/kg with an estimated mean of 7.4 mg/kg (Ref. 40, p. 10). The background sample containing the highest concentration for arsenic, RESI-BGSS-05, was used to determine the significance of the concentrations of these metals detected in Source 3 (Ref. 4, Attachment, pp. 11 and 58). The ESI background sampling locations are shown in Figure 3 in the appendix. Source 3 sampling locations are shown in Figure 6 in the appendix. The source samples were analyzed in accordance with EPA method SW-846 (Ref. 18, p. 08). Data validation of Source 3 was performed by EPA REAC contractor Lockheed Martin (Ref. 18, pp. 1-6 and 82-85). The background samples were collected, analyzed, and validated according to EPA CLP protocols (Ref. 4, p. 12 and Attachment, pp. 2-6).

2.4.1 Hazardous Substances (continued)

Hazardous Substance	Evidence	Sample Concentration (mg/kg)	Background Concentration RR-BGSS-05 (mg/kg)	MDL* (mg/kg)	Reference
Metals					
Arsenic	RR-S-078A	540	6.7K	7.5	18, p. 25
	RR-S-079A	560	6.7K	7.5	18, p. 25
	RR-S-082	2,400	6.7K	9.2	18, p. 28
	RR-S-084	70	6.7K	8.8	18, p. 29
	RR-S-085	220	6.7K	8.1	18, p. 29
	RR-S-087	55	6.7K	7.8	18, p. 29
	RR-S-109	110	6.7K	8.6	18, p. 28

* The laboratory adjusted the data for percent solids to determine the method detection limit; therefore, the laboratory method detection limit is equivalent to the sample quantitation limit (Ref. 18, p. 11).

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

MDL Method detection limit

mg/kg Milligram per kilogram

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Source 3.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

2.4.2.1.2 Hazardous Waste Stream Quantity

<u>Hazardous Waste Stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous waste stream quantity for Source 3.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

The information available is not sufficient to adequately evaluate the volume for Source 3.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

2.4.2.1.4 Area

The area of Source 3 is delineated by the elevated concentrations of arsenic, lead, and copper detected in the soil samples documented in Section 2.4.1. This area is approximately 3,014 ft², as shown in Figure 6 in the appendix (Ref. 13). Each sampling location was recorded using GPS coordinates (Ref. 42). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background into the Arcview 3.2 computer program. The area of Source 3 (as shown on Figure 6 in the appendix) was then calculated in Arcview 3.2 by measuring the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt to give a conservative estimate since contamination is not known to exist beneath such surfaces (Ref. 13).

Area of source (ft²): 3,014

Area Assigned Value (Ref. 1, Table 2-5): 3,014/34,000 = 0.09

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value is assigned the value of the area of Source 3.

Source Hazardous Waste Quantity Value: 0.09

2.2 Source Characterization

Source Number: 4

Source Description: Contaminated Soil/Eastern Edge of Former Pesticide Facility Disposal Area

Source Type: Contaminated Soil

From approximately 1920 to 1940, a pesticide manufacturing facility was located on the north side of Ryeland Road. The facility manufactured a pesticide that contained arsenic acid. By-products of the arsenic acid manufacturing process included lead arsenate, calcium arsenate, and possibly copper acetoarsenate (Ref. 5, p. 1). Wastes generated during the manufacturing process, which included arsenic, copper, and lead compounds, were reportedly disposed around the facility property and on a parcel of land located on the south side of Ryeland Road, southeast of the facility (Ref. 6, p. 8). Subsequent sampling and analysis of soils located in these areas has identified elevated levels of arsenic, copper, and lead.

Source 4 is a 1,876-ft² area of contaminated soil located on the reported waste disposal area (see Figures 3 and 7 in the appendix) (Ref. 13). The boundaries of Source 4 are defined by analytical results of soil samples collected in this area that document concentrations of arsenic above background levels (Ref. 18, pp. 24, 25 and 30; 19; 20, p. 0017).

Source Location:

Source 4 is located on the south side of Ryeland Road on the property formerly used by the pesticide facility as a disposal area (Ref. 6, p. 8). Source 4 extends onto a residential property east of the former disposal area, and within 200 feet of the residence on that property, as shown in Figures 3 and 7 in the appendix.

Containment:

Release to Ground Water: There is no evidence that a maintained engineered cover or functioning and maintained run-on control system and runoff management system was in place at Source 4; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 3-2).

Release via overland migration and/or flood: There is no evidence that a maintained engineered cover or functioning and maintained run-on control system and runoff management system was in place at Source 4; therefore, a containment factor value of 10 was assigned (Ref. 1, Table 4-2).

Gas Release to Air: The air migration pathway was not scored.

Particulate Release to Air: The air migration pathway was not scored.

2.4.1 Hazardous Substances

Evidence that hazardous substances are present at Source 4 is documented by the laboratory analysis of soil samples collected at depths ranging from 0 to 12 inches bgs during the 2001-2002 EPA removal action (Refs. 8, Logbook 1, pp. 57, 58, 65, 67, 68 and Logbook 2, p. 130; 18, pp. 82, 84, and 85; 20, p. 4). The soil types of Source 3 are mapped as Clarksburg silt loam and Laidig gravelly loam. The Clarksburg soil series is characterized as very deep, moderately well drained soil that formed in fine-loamy colluvium weathered from limestone, siltstone, and shale. The Clarksburg soil series contains 1 to 3 percent organic matter in the surface layer. The Laidig soil series is characterized as very deep, well drained soils that formed in fine-loamy colluvium weathered from sandstone and siltstone. The Laidig soil series contains 2 to 4 percent organic matter in the surface layer (Ref. 65). No background soil samples were collected during the removal action. To establish background concentrations of metals in the vicinity of the site, five background soil samples were collected during the 2002 ESI, at depths ranging from 0 to 24 inches bgs (Ref. 4, p. 12 and Attachment, p. 28; 23, pp. 49-51). The soil type of the background soil samples is mapped as Laidig gravelly loam (Ref. 65).

Arsenic concentrations detected in the ESI background samples ranged from 3.3 to 6.7 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). According to published data, the observed range of arsenic concentrations in the eastern United States is from <0.1 to 73 mg/kg with an estimated mean of 7.4 mg/kg (Ref. 40, p. 10). The background sample containing the highest concentration for arsenic, RESI-BGSS-05, was used to determine the significance of the concentrations of these metals detected in Source 4 (Ref. 4, Attachment, pp. 11 and 58). The ESI background sampling locations are shown in Figure 3 in the appendix. Source 4 sampling locations are shown in Figure 7 in the appendix. Source samples were analyzed in accordance with EPA method SW-846, 7000, or 6010 and the data was validated by EPA REAC contractor Lockheed Martin (Ref. 18, pp. 1-5, 8, and 82-85; 19). The background samples were collected, analyzed, and validated according to EPA CLP protocols (Ref. 4, p. 12 and Attachment, pp. 2-6, 10, and 54).

2.4.1 Hazardous Substances (continued)

Hazardous Substance	Evidence	Concentration (mg/kg)	Background Concentration RR-BGSS-05 (mg/kg)	MDL/ Reporting Limit* (mg/kg)	Reference
Metals					
Arsenic	RR-S-072A	190	6.7K	7.7	18, p. 24
	RR-S-073A	360	6.7K	7.5	18, p. 24
	RR-S-074A	120	6.7K	7.7	18, p. 24
	RR-S-077A	22	6.7K	0.98	18, p. 25
	RR-S-094	240	6.7K	7.8	18, p. 30
	RR-S-095	100	6.7K	7.8	18, p. 30
	RR-SS-190	42	6.7K	0.9	19; 20, p. 0017

* The laboratory adjusted the data for percent solids to determine the method detection limit/reporting limit; therefore, the laboratory method detection limit/reporting limit is equivalent to the sample quantitation limit (Ref. 18, p. 11; Ref. 20).

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

mg/kg Milligrams per kilogram

MDL Method detection limit

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

Hazardous Substance	Constituent Quantity (pounds)	Reference
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Source 4.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

2.4.2.1.2 Hazardous Waste Stream Quantity

Hazardous Waste Stream	Quantity (pounds)	Reference
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The information available is not sufficient to adequately evaluate the hazardous waste stream quantity for Source 4.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

2.4.2.1.3 Volume

Information available is not sufficient to adequately evaluate the volume for Source 4.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

2.4.2.1.4 Area

The area of Source 4 is delineated by the elevated concentrations of arsenic, copper, and lead detected in the soil samples documented in Section 2.4.1. This area is approximately 1,876 ft², as shown in Figure 7 in the appendix (Ref. 13). Each sampling location was recorded using GPS coordinates (Ref. 42). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background into the Arcview 3.2 computer program. The area of Source 4 (as shown in Figure 7 in the appendix) was then calculated in Arcview 3.2 by measuring the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt to give a conservative estimate since contamination is not known to exist beneath such surfaces (Ref. 13).

Area of source (ft²): 1,876

Area Assigned Value (Ref. 1, Table 2-5): 1,876/34,000 = 0.06

2.4.2.1.5 Source Hazardous Waste Quantity Value

The source hazardous waste quantity value is assigned the value of the area of Source 4.

Source Hazardous Waste Quantity Value: 0.06

SUMMARY OF SOURCES EVALUATED

Source No.	Source Name	Source Hazardous Waste Quantity Value	Source Containment Values			
			Ground Water	Surface Water	Air Gas	Air Particulate
1	Contaminated Soil/ West of Former Pesticide Facility	0.1	10	10	NS	NS
2	Contaminated Soil/ Former Pesticide Facility	0.92	10	10	NS	NS
3	Contaminated Soil/ Western Edge of Former Pesticide Facility Disposal Area	0.09	10	10	NS	NS
4	Contaminated Soil/ Eastern Edge of Former Pesticide Facility Disposal Area	0.06	10	10	NS	NS

NS Not scored

Sum of Hazardous Waste Quantity (HWQ) Values: 1.17

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 General Considerations

Geology

Description:

The areas of contaminated soil at the Ryeland Road Arsenic site are located in the Lebanon Valley sub-division of the Great Valley section of the Valley and Ridge Physiographic Province (Ref. 44, pp. 1, 2, 4 and 5, Plate 1). The Lebanon Valley sub-division is characterized by carbonate rocks of the Beekmantown and Conococheague Groups ranging in age from early Cambrian to late Ordovician (Ref. 44, p. 1). The low topographic relief of the valley is a result of the solubility of the limestone and dolomite sequences that comprise the valley. Disappearing streams and sinkholes are common physiographic features of the valley (Ref. 44, pp. 2, 4, and 5). Other major structural features within 4-miles of the source areas include numerous thrust and linear faults as shown on the Womelsdorf, Richland, and Sinking Spring Geologic Quadrangle maps (Ref. 44, Plate 1; 45; 46, Plate 1).

As shown on the Womelsdorf quadrangle, the Millbach and Snitz Creek formations of the Conococheague Group directly underlie the source areas (Ref. 44, Plate 1). The Snitz Creek formation is characterized by medium to light gray, coarsely crystalline dolomite and is expected to be approximately 500 feet thick. The Millbach formation is characterized by thick sequences of limestone and dolomite and is expected to be approximately 1,450 feet thick (Ref. 44, pp. 28-39, Plate 1).

Other formations located within a 4-mile radius of the source areas include the Richland formation, the third formation of the Conococheague Group. The Richland formation is characterized by predominantly dolomitic beds and exceeds a thickness of 1,700 feet (Ref. 44, pp. 28-39, Plate 1). The Snitz Creek is the oldest formation of the Conococheague Group followed by the Millbach and then the Richland. However, as shown in the Womelsdorf Quadrangle, these carbonate rock formations have been overturned and lay stratigraphically from oldest to youngest with the Snitz Creek overlying the Millbach (Ref. 44, p. 1, Plate 1).

Just south of the source areas is a major uplift, defined as South Mountain, which thrusts Precambrian granite gneiss and crystalline rocks of the Hardyston formation over the carbonate rocks of the Great Valley (Ref. 44, p. 25, Plate 1). The Hardyston formation consists of fine- to medium-grained, quartzitic sandstone and sedimentary quartzite that forms the ridges of South Mountain (Ref. 44, p. 1, Plate 1).

The Tomstown (Leithsville) formation lies stratigraphically above the Hardyston formation and consists of medium- to finely-grained, crystalline, sandy dolomite. The Tomstown formation in this area has been intensely fractured as a result of structural movements of surrounding plates (Ref. 44, p. 27, Plate 1). The Buffalo Springs formation, which overlies the Tomstown (Leithsville) formation, consists of coarsely crystalline limestone interbedded with finely crystalline dolomite and has a minimum thickness of 500 feet (Ref. 44, p. 29, Plate 1).

Also present within 4-miles of the source areas are the limestone and dolomite formations of the Beekmantown Group. The Beekmantown Group includes the Stonehenge, Rickenbach, Epler, and the Ontelaunee formations and are chronologically younger than the Conococheague Group (Refs. 44, pp. 40-42, Plate 1; 45; 46, Plate 1; 47; 48). However, north of the source areas the overturned carbonates of the Conococheague Group have been thrust on top of the formations comprising the Beekmantown Group (Ref. 44, Plate 1). The Beekmantown Group is then thrust over the limestone formations of the Annville, Myerstown, and Hershey (Ref. 44, pp. 43-45, Plate 1). Several isolated areas of the Martinsburg Shale formation are present within 4-miles of the source areas, mostly along thrust faults marking the boundary between underlying limestone formation (Refs. 44, p. 45, Plate 1; 46, Plate 1). As shown in the Sinking Spring quadrangle, a thrust of the Lehigh Valley sub-division, the Jacksonburg limestone formation, has been thrust between the Hershey and Martinsburg formations (Refs. 46, pp. 62 and 63, Plate 1). North and east of the source areas are a sequence of silty, siliceous shale, sandstone, finely crystalline limestone, and shaly limestone rocks known as the Hamburg sequence (Ref. 46, Plate 1; 47; 48; and 49, pp. 135 and 136).

Hydrogeology

Ground water in the Valley and Ridge aquifers moves along fractures and bedding planes in all rock types, and in solution channels of carbonate rocks (Ref. 22, p. 5). The Lebanon Valley subdivision, in which the source areas are located, is predominantly underlain by carbonate rocks, many of which display karst attributes such as sinkholes (Refs. 44, p. 5; 46, pp. 211 and 212, Plate 1; 49, pp. 188, 189, 262, and 263). Major thrust and tear faults occur along boundaries of almost every formation within a 4-mile radius of the source areas (Refs. 44, pp. 46 and 48, Plate 1; Ref. 46, Plate 1). The thrust and tear faults present in the formations result in highly fractured rock strata (Refs. 46, Plate 1; 49, pp. 27, 51, 111, 135, 141, 147, 151, 160, 176, 188, 193, 213, 239, 240, 241, 262, 269).

Because of the presence of karst formations and highly fractured rock strata underlying and within 4-miles of the source areas, ground water flowing through more permeable carbonate rocks has the potential to penetrate through less permeable formations via joints, fractures, faults, and bedding planes. However, groundwater is unlikely to flow into the granitic gneiss of South Mountain and the Hardyston Formation

located south of the source areas because of its extremely low permeability and poorly formed fractures (Refs. 46, pp. 210 and 211; 49, pp. 128, 129, 140, and 141). The aquifer that underlies the source areas and the additional aquifers within a 4-miles radius of the source areas are discussed below.

Aquifers/Stratum Names: Conococheague Group

Aquifer 1/Stratum 1:

Description:

The Snitz Creek and Millbach formations of the Conococheague Group are located directly under the source areas (Ref. 44, Plate 1). The Snitz Creek formation is a medium-gray dolomite with an approximate thickness of 500 feet (Ref. 44, p. 28, Figure 10). The Snitz Creek formation has a moderate to high permeability with solution channels providing a moderate to high secondary porosity. Rock fractures within the Snitz Creek formation have a blocky pattern, are moderately well developed, and are moderately to highly abundant (Ref. 49, pp. 262 and 263). The Millbach formation is interbedded with a light- to pinkish-gray limestone and dolomite with an approximate thickness of 1,500 feet (Ref. 44, p. 28, Figure 10). The Millbach formation has a high permeability with solution channels providing a moderate to high secondary porosity. Rock fractures within the Millbach formation have a blocky pattern, are well developed, and are moderately abundant. Sinkholes are numerous within the Millbach formation (Ref. 49, pp. 188 and 189).

Aquifers/Stratum Names: Buffalo Springs formation, Tomstown (Leithsville) formation, Richland formation, Beekmantown Group, Annville formation, Myerstown formation, Hershey formation, Jacksonburg formation, Martinsburg formation, Hamburg Sequence

Additional Aquifers within a 4-mile radius of the source areas:

Description from oldest to youngest:

The Buffalo Springs formation is fine to coarsely crystalline limestone interbedded with dolomite. The Buffalo Springs formation has a low permeability with solution channels providing a moderate secondary porosity (Ref. 49, pp. 51 and 52).

The Tomstown (Leithsville) formation is predominantly dolomite with some calcareous shale and sandy dolomite. The Tomstown (Leithsville) formation has a moderate to high permeability with joint and solution channels providing a high secondary porosity (Ref. 49, p. 160 and 161).

The Richland formation of the Conococheague Group lies to the north of the source areas, consists of a medium-gray dolomite, and has an approximate thickness of at least 1,700 feet (Ref. 44, p. 28, Figure 10).

The Richland formation has a low to moderate permeability with solution channels providing a low to moderate secondary porosity (Ref. 49, pp. 239 and 240).

The Beekmantown Group, consisting of the Stonehenge, Rickenbach, Epler, and Ontelaunee formations, lies to the north of the source areas (Ref. 44, pp. 40-42, Plate 1). The Stonehenge formation is finely crystalline limestone with a high permeability and a low to moderate secondary porosity through joints and solution channels. Sinkholes are characteristic of the Stonehenge formation (Ref. 49, pp. 269 and 270). The Rickenbach formation is very fine to coarsely crystalline, laminated dolomite with a high permeability. The joints and solution channels in the Rickenbach formation provide a low to moderate secondary porosity (Ref. 49, pp. 240 and 241). The Epler formation is very finely crystalline limestone interbedded with dolomite and has a low permeability with a low to medium secondary porosity through joints and solution channels. Sinkholes and caves are characteristic within the Epler formation (Ref. 49, pp. 110 and 111). The Ontelaunee formation is very fine- to medium-crystalline dolomite and is highly permeable with a moderate to high secondary porosity through joints and solution channels (Ref. 49, pp. 213 and 214). Sinkholes are numerous within the Ontelaunee formation (Ref. 46, Plate 1).

The Annville formation is high-calcium limestone and has a low permeability with a moderate to high secondary porosity through joints and solution channels. Sinkholes are common within the Annville formation (Ref. 49, pp. 26 and 27).

The Myerstown formation is medium-crystalline limestone and has a low to moderate permeability with joints and solution channels providing a low secondary porosity (Ref. 49, pp. 192 and 193). Some development of sinkholes can be found within the Myerstown formation (Ref. 46, Plate 1).

The Hershey formation is an argillaceous limestone with a low permeability and a low secondary porosity through joints and solution channels (Ref. 49, pp. 147 and 148). The Jacksonburg formation is a coarsely crystalline limestone with a low to moderate permeability (Ref. 49, pp. 151 and 152). The Hershey and Jacksonburg formation are mapped as the same unit on the Sinking Springs Quadrangle Map; however, the Hershey formation is listed as being of the Lebanon Valley sequence and the Jacksonburg is listed as being of the Lehigh Valley sequence (Ref. 46, Plate 1).

The Martinsburg formation is highly fractured shale and has a low permeability with a low secondary porosity through cleavage and joints (Refs. 46, Plate 1; 49, pp. 176 and 177).

The Hamburg sequence consists of silty siliceous shale, sandstone, finely crystalline limestone, and shaly limestone. The limestone of the sequence have a very high porosity with joints providing a moderate secondary porosity (Ref. 49, pp. 135 and 136). Some development of sinkholes exists within the limestone of the Hamburg and Martinsburg formations (Ref. 46, Plate 1).

Within the 4-mile site radius, the Snitz Creek formation, Millbach formation, Richland formation, and the Epler formation have steep to vertical dip and in some cases are overturned. Additionally, each of these units has moderate to high primary porosity due to fractured flow mechanics (Ref. 44, Plate 1). The steeply dipping beds and the fractured flow characteristics of the above-mentioned aquifers suggest aquifer interconnection. Topographic elevations of the above mentioned geologic units range from 400 to 560 feet above mean sea level throughout the 4-mile radius. It is possible that vertical aquifer discontinuities occur at the distal areas of the 4-mile radius. However, in the areas adjacent to the site, the likelihood of vertical discontinuities diminishes.

The remaining aquifer units within the 4-mile radius have a lesser potential for being interconnected. The interconnectivity of the remaining aquifers is limited by topographic vertical discontinuities (vertical relief), stratigraphic/structural discontinuities such as the Hardystone formation and the South Mountain uplift, and low primary porosity (Ref. 44, p. 25, Plate 1).

3.1 Likelihood of Release

3.1.1 Observed Release

Aquifer Being Evaluated: Conococheague Group

Chemical Analysis:

- Background Samples

EPA START collected a residential well sample during the 2002 ESI to document background ground water conditions at the (Ref. 4, Table 4, p. 19, Attachment, p. 194). The sample was collected from a 240-foot deep domestic well completed in the Snitz Creek formation of the Conococheague Group as shown in Figure 8 in the appendix (Refs. 8, Logbook 1, pp. 108-109; 23, p. 50; 44, Plate 1). The sample used to document background ground water conditions, RESI-BGDW-01, was collected at the spigot of the water storage tank prior to filtration after purging the well by running the kitchen faucet for 15 minutes (Ref. 4, pp. 17 and 19; 23, pp. 50 and 51). The background ground water sample was analyzed for target analyte list metals by EPA Region 3 Office of Analytical Services and Quality Assurance (OASQA) in accordance with EPA CLP Statement of Work using Methods 200.2, 200.7, and 200.9 (Refs. 4, p. 19; Attachment, p. 191). OASQA validated the analytical results for the background ground water sample; analytical results are provided in Reference 4, Attachment, pp. 181, 186 to 196.

Sample ID	Depth (Feet)	Date Sampled	Reference
RESI-BGDW-01	240	05/21/02	8, Logbook 1, pp. 108-109; 23, pp. 50 and 51

Sample ID	Hazardous Substance	Concentration (: g/L)	NQL (: g/L)	Reference
RESI-BGDW-01	Copper	ND	25	4, Attachment, p. 186; 58, p. 30
RESI-BGDW-01	Lead	4	2	4, Attachment, p. 186; 58, p. 30

ND Substance not detected above the detection limit.
 NQL Nominal quantitation limit
 : g/L Micrograms per liter

– Contaminated Samples

EPA START collected domestic well ground water samples during the 2002 ESI (Ref. 4, Table 4, pp. 17, 18, and 19). Samples were collected from wells ranging in depth from 80 to 120 feet and completed within the Snitz Creek or Millbach formations of the Conococheague group (Ref. 23, pp. 34-38; 44, Plate 1). The depth of several of the wells sampled are not known. Based on information obtained from the Pennsylvania Department of Environmental Protection's (PADEP) eMapPA database of the Pennsylvania Groundwater Information System (PAGWIS), the depth of domestic wells within a 4-mile radius of the site ranges from 41 to 545 feet with the average well depth being approximately 198 feet (Ref. 50). The Snitz Creek and Millbach formations have a combined approximate thickness of 2,000 feet; therefore, the domestic wells sampled during the ESI were completed in the Snitz Creek or Millbach formations of the Conococheague Group, the same aquifer as the background sample (Ref. 44, p. 28). Samples used to document an observed release were collected in the same manner as the background sample, from the spigot at the storage tank prior to filtration after purging the well for approximately 15 minutes (Refs. 4, Table 4, pp. 17, 18, and 19; 23, pp. 18 to 24 and 34 to 38). The observed release ground water samples were analyzed for target analyte list metals by the EPA Region 3 OASQA in accordance with CLP Statement of Work EPA using Methods 200.2, 200.7, and 200.9 (Ref. 4, p. 19; Attachment, p. 191). OASQA validated the analytical results for the observed release ground water samples; analytical results are provided in Reference 4, Attachment, pp. 178 to 196.

Samples collected from the following residential drinking water wells document an observed release to the Conococheague Group aquifer. Ground water sampling locations are shown in Figure 8 in the appendix.

Sample ID	Depth (Feet)	Date(s) sampled	Reference
RESI-DW-01	unknown*	05/19/02	4, Table 4, p. 17; 23, pp. 18 and 19
RESI-DW-04	unknown*	05/19/02	4, Table 4, p. 18; 23, pp. 19 and 20
RESI-DW-07	unknown*	05/19/02	4, Table 4, p. 18; 23, pp. 21, 22, and 24
RESI-DW-10	unknown*	05/19/02	4, Table 4, p. 18; 23, pp. 23 and 24
RESI-DW-13	80	05/20/02	4, Table 4, p. 18; 23, pp. 34 and 35
RESI-DW-16	88	05/20/02	4, Table 4, p. 18; 23, pp. 35 and 36
RESI-DW-19	120	05/20/02	4, Table 4, p. 19; 23, pp. 37 and 38

* The exact depth of these wells is not known; however, according to available data, the average well depth in the vicinity of the site is about 198 feet with the deepest well occurring at 545 feet (Ref. 50)

– Contaminated Samples (Continued)

Sample ID	Hazardous Substance	Concentration (: g/L)	NQL (: g/L)	Reference
RESI-DW-01	Copper	1,030	25	4, Attachment, p. 182; 58, p. 30
	Lead	190	2	4, Attachment, p. 182; 58, p. 30
RESI-DW-04	Copper	44	25	4, Attachment, p. 182; 58, p. 30
RESI-DW-07	Copper	518	25	4, Attachment, p. 183; 58, p. 30
	Lead	48	2	4, Attachment, p. 183; 58, p. 30
RESI-DW-10	Copper	40	25	4, Attachment, p. 183; 58, p. 30
RESI-DW-13	Copper	348	25	4, Attachment, p. 184; 58, p. 30
	Lead	35	2	4, Attachment, p. 184; 58, p. 30
RESI-DW-16	Copper	183	25	4, Attachment, p. 185; 58, p. 30
	Lead	33	2	4, Attachment, p. 185; 58, p. 30
RESI-DW-19	Lead	36	2	4, Attachment, p. 185; 58, p. 30

: g/L Micrograms per liter

NQL Nominal quantitation limits

- **Level I Samples**

The following residential wells have concentrations of lead above the EPA action level (set under the Safe Drinking Water Act) of 15 : g/L (Ref. 2, p. B-34). Therefore, these wells are documented as Level I targets (Ref. 1, Section 2.5.2, Table 3-10).

Sample ID	Sample Date	Hazardous Substance	Sample Concentration (: g/L)	Action Level* (: g/L)	Reference
RESI-DW-01	05/19/02	Lead	190	15	4, Attachment, p. 182
RESI-DW-07	05/19/02	Lead	48	15	4, Attachment, p. 183
RESI-DW-13	05/20/02	Lead	35	15	4, Attachment, p. 184
RESI-DW-16	05/20/02	Lead	33	15	4, Attachment, p. 185
RESI-DW-19	05/20/02	Lead	36	15	4, Attachment, p. 185

* No maximum contaminate level for lead currently exists; therefore, EPA's action level was used to determine Level I concentrations.

: g/L Micrograms per liter

Attribution:

From 1920 to 1940 the SCWC and subsequently the ACC operated a pesticide, fungicide, paint, and varnish manufacturing plant on the north side of Ryeland Road. As part of the pesticide manufacturing process, arsenic was converted to arsenic acid, which resulted in by-products of lead arsenate, calcium arsenate, and copper acetoarsenate (Ref. 5, p. 1). Reportedly, waste generated during the manufacturing process that consisted of arsenic, copper, and lead compounds was disposed of around the facility property on the north side of Ryeland Road and on a parcel of land located on the south side of Ryeland Road (Ref. 6, p. 8). As documented in Section 2.4.1 of this documentation record, analytical results from soil samples collected during the 2001-2002 EPA removal action and the 2002 ESI indicate the presence of arsenic-, copper-, and lead-contaminated soil. Analytical results from residential wells indicate that copper and lead are present in ground water at concentrations three times above background levels. Copper and lead have also been documented in on-site surface soils at concentrations three times above background levels.

As part of the 2002 ESI, the composition of the piping in residences with domestic wells and the results of field lead wipe tests were recorded in the ESI logbook. The background sampling location tested positive for lead solder at the storage tank tap, as did most of the release sampling locations. The background sampling location and the observed release sampling locations, with the exception of RESI-GW-04, RESI-DW-07, and RESI-DW-10, consisted of poly vinyl chloride (PVC) piping entering the home from the well (Ref. 23, pp. 18-24, 34-38, and 50-51). Therefore, the elevated concentrations of lead detected in the release samples can partially be attributed to the site since the concentrations were greater than three times background levels, which also tested positive for lead solder. Copper contamination can also be partially attributed to the site since all but one well (RESI-DW-07) was sampled prior to flowing through copper piping (Ref. 23, pp. 21 and 22).

Hazardous Substances Released:

Copper

Lead

3.2 Waste Characteristics

3.2.1 Toxicity/Mobility

Presented below are the hazardous substances documented at the source areas at the Ryeland Road Arsenic site that have a ground water containment value greater than zero.

Hazardous Substance	Source No.	Toxicity Factor Value	Ground Water Mobility Factor Value*	Toxicity/Mobility	Reference
Arsenic	1, 2, 3, 4	10,000	1	10,000	2, p. BI-1
Copper	2	NL	1	NA	2, p. BI-3
Lead	1, 2	10,000	1	10,000	2, p. BI-8

* Karst ground water mobility factor value assigned for nonliquid hazardous substances

NA Not applicable

NL Value unknown

Toxicity/Mobility Factor Value: 10,000
(Ref. 1, Table 3-9)

3.2.2 Hazardous Waste Quantity

Source No.	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
1	0.1	No
2	0.92	No
3	0.09	No
4	0.06	No
Sum	1.17	

Hazardous Waste Quantity Factor Value (Ref. 1, Table 2-6): 100*

* As documented in Section 3.1.1, targets are subject to Level I concentrations; therefore, a HWQ value of 100 is assigned for the ground water pathway (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100

GW - Waste Characteristic Factor Category Value

3.2.3 Waste Characteristics Factor Category Value

The waste characteristics factor category value is obtained by multiplying the highest toxicity/mobility factor value by the HWQ factor value (Ref. 1, Section 3.2.3). Based on this product, a waste characteristic factor category value is assigned from HRS Table 2-7 (Ref. 1, Section 2.4.3).

The highest toxicity/mobility factor value assigned to the ground water pathway is for lead (10,000).

Toxicity/Mobility Factor Value (10,000) x HWQ Factor Value (100): 1×10^6

Waste Characteristics Factor Category Value: 32

3.3 Targets

The Womelsdorf-Robeson Joint Water Authority (WRJWA), Newmanstown Water Authority (NWA), Richland Borough Water Authority (RBWA), and Bethany Children's Home (BCH) obtain ground water within a 4-mile radius of the site for public distribution (Ref. 7, p. 2-1). The PAGWIS database does not identify any other public water suppliers within a 4-mile radius of the source areas (Ref. 50).

As shown in Figure 9 in the appendix, WRJWA obtains water for public distribution from four wells within a 4-mile radius of the source areas, Well Nos. 1, 2, 8, and 9 (Refs. 51; 52). Well No. 1 is 325 feet deep and completed in the Tomstown (Leithsville) formation. Well No. 2 and 8 are completed in the granite gneiss and are 143 and 381 feet deep, respectively. Well No. 9 is 400 feet deep and is completed in the Richland formation (Refs. 51; 52). WRJWA maintains a blended water supply system and provides water to approximately 6,930 people in the boroughs of Womelsdorf, Robeson, Sheridan, and along Route 422 between Womelsdorf and Robeson (Refs. 27; 52; and 53). Based on the individual well pumping capacity, no one well of the WRJWA contributes more than 40 percent of the total supply (Ref. 53).

NWA obtains water for public distribution from two wells within a 4-mile radius of the site, as shown in Figure 9 in the appendix. Both wells are completed in the Millbach formation and are 260 and 310 feet deep. Water obtained from these wells is blended for distribution (Ref. 54). NWA supplies water to approximately 900 people within Newmanstown Township (Refs. 29; 53).

RBWA maintains four ground water supply wells and a spring for public distribution of water to approximately 1,700 people within the Borough of Richland (Refs. 28; 53). As shown in Figure 9 in the appendix, two of the wells (Well Nos. 2 and 3) and the spring are known to be within 4 miles of the source area (Refs. 53; 55). The location of Well Nos. 4 and 6 could not be determined from available data. Well Nos. 2 and 3 and the spring are completed in the Tomstown (Leithsville) formation and Well No. 4 is completed in the Richland formation. The depth and geology of Well 6 is not known (Ref. 53). The RBWA maintains a blended system; therefore, all persons receiving water from RBWA are potential targets (Ref. 56). The pumping capacity for Well No. 6 is not known. No one well of the remaining three or the spring contributes greater than 40 percent of the total supply based on the well pumping capacity (Ref. 53).

BCH's water is supplied by a spring that emerges from the Snitz Creek formation of the Conococheague Group (Ref. 53). BCH supplies water to approximately 200 people, including apartments and 11 residences along Ryeland Road, as shown in Figure 8 in the appendix (Ref. 53; 57).

GW - Targets

The table below details the municipal water systems with wells or springs that obtain water from the interconnected aquifers located within a 4-mile radius of the site. Samples were not collected from any distribution supply system; therefore, all targets associated with public supply systems are subject to potential contamination. Figure 9 in the appendix shows the approximate public supply areas of the BCH, WRJWA, RBWA, and NWA (Ref. 27; 28; 29; and 57).

Radius Distance From Site (miles)	Public Water Supplier	Number of Wells/Springs	Total Population Served	Reference
0-0.25	None	NA	0	50
0.25-0.5	BCH	1 spring	200	53
0.5-1	WRJWA	1 well	1,732.5	51; 52; 53
1-2	WRJWA	3 wells	5,197.5	51; 52; 53
	NWA	2 wells	900	53; 54
2-3	RBWA	2 wells	680	53; 55
3-4	RBWA	1 Spring	340	53; 55

BCH	Bethany Children's Home
NA	Not Applicable
NWA	Newmanstown Water Authority
RBWA	Richland Borough Water Authority
WRJWA	Womelsdorf-Robeson Joint Water Authority

In addition to the public supply wells outlined above, there are domestic wells located within the 4-mile TDL. All residents located outside the public supply areas are assumed to rely on domestic wells for their potable supply. The estimated population served by domestic wells is documented in the table below. Figure 9 in the appendix was used to conduct a count of residences not serviced by public water within the 0 to 0.25-mile and 0.25 to 0.5-mile distance rings to determine the population relying on domestic wells for their water supply within 0.5 mile of the source areas. All residences between the 0 to 0.5-mile distance rings are located along Ryeland Road or to the north of Ryeland Road, as shown in Figure 9 in the appendix. Therefore, if the average domestic well is approximately 200 feet deep, these wells would be completed in the Conococheague Group aquifer or the interconnected Beekmantown Group aquifer (Refs. 44, Plate 1; 50). The PAGWIS database was used to determine the number of domestic wells completed in interconnected aquifers from a 0.5-mile to 4-mile radius from the source areas (Ref. 50). The number of wells within each distance ring that are completed within the interconnected aquifers were multiplied by the number of the average number of persons per household for each county (2.55 for Berks County, 2.49 for Lebanon County, and 2.64 for Lancaster County) to determine the estimated population that rely on ground water from domestic wells (Ref. 43, pp. 2, 4, 6).

Radius Distance From Site (Miles)	Population (No. of Wells)			
	Berks County	Lebanon County	Lancaster County	Total
0-0.25	22.95 (9)	0	0	22.95
0.25-0.5	51 (20)	0	0	51
0.5-1	2.55 (1)	0	0	2.55
1-2	7.65 (3)	0	0	7.65
2-3	20.4 (8)	22.41 (9)	0	42.81
3-4	2.55 (1)	17.43 (7)	0	19.98

3.3.1 Nearest Well

As documented in Section 3.3.2.2, 2002 ESI residential sampling locations RESI-DW-01, RESI-DW-07, RESI-DW-13, RESI-DW-16, and RESI-DW-19, are subject to Level I contamination; therefore, the nearest well factor value is 50.

Nearest Well Factor Value: 50
(Ref. 1, Table 3-11)

3.3.2. Population

3.3.2.2 Level I Concentrations

As documented in Section 3.1.1, concentrations of lead in the wells listed below exceed the EPA action level for lead; therefore, these targets are subject to Level I concentrations.

Level I Well	Population	Reference
RESI-DW-01	4	23, p. 18
RESI-DW-07	2	23, p. 21
RESI-DW-13	2	23, p. 34
RESI-DW-16	2	23, pp. 35, 36
RESI-DW-19	5	23, pp. 37, 38
Total Level I Population	15	

Population Served by Level I Wells x 10: 150

Level I Concentrations Factor Value: 150

3.3.2.3 Level II Concentrations

The following residential wells have concentrations of copper that are three times above the background concentration; therefore, these wells are subject to Level II concentrations.

Level II Wells	Population	Reference
RESI-DW-04	5	23, p. 20
RESI-DW-10	2	23, p. 23
Total Level II Population	7	

Population Served by Level II Wells: 7

Level II Concentrations Factor Value: 7

3.3.2.4 Potential Contamination

The table below summarizes the population within the 4-mile target distance limit (TDL) that rely on public or private wells that have not been counted under Level I or Level II targets. The Conococheague Group aquifer and the interconnected surrounding aquifers are predominantly limestone and dolomite formations exhibiting karst characteristics such as sinkholes, springs, and caverns (Refs. 44, p. 5; 46, pp. 211 and 212, Plate 1).

Radius Distance From Site (Miles)	Public Supply	Private Supply	Total⁺	Distance-weighted population value (Ref. 1, Table 3-12)
0-0.25	0	22.95-[15+7]* = 0.95	1	4
0.25-0.5	200	51	251	102
0.5-1	1,732.5	2.55	1,735	817
1-2	5,197.5	7.65	5,205	2,607
2-3	680	42.81	723	261
3-4	340	19.98	360	261

* The population subjected to Level I (15) and Level II (7) concentrations were subtracted from the population within the 0-0.25 distance ring to determine the population subjected to potential contamination.

⁺ Rounded to the nearest integer (Ref. 1, Table 3-12).

Sum of Distance -Weighted Population Values: 4,052

Potential Contamination Factor Value = Sum of Distance-Weighted Population Value / 10: 405

3.3.2.5 Population Factor Value

**Population Factor Value = Level I factor value (150) + Level II factor value (7)
+ Potential Contamination Value (405) = 562**

GW Population Factor Value: 562

3.3.3 Resources

Well	Aquifer	Resource Use	Reference
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No ground water resource uses have been identified in the study area.

Resource Factor Value: 0
(Ref. 1, Section 3.3.3)

3.3.4 Wellhead Protection Area

No wellhead protection area has been identified within the study area.

Wellhead Protection Area Factor Value: 0
(Ref. 1, Section 3.3.4)

SWOF - Surface Water Overland Flow/Flood Migration Pathway

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 Overland/Flood Migration Component

4.1.1.1 Definition of the Hazardous Substance Migration Pathway for the Overland/Flood Component

The four source areas are located within one watershed. All overland flow from the source areas channels into a drainage swale that runs through the site. The swale originates to the south of the site, runs through Source 3, and continues northwest under Ryeland Road. The swale intersects Source 2 and changes direction to run west through Source 2 prior to running north, underneath the railroad tracks where it discharges into a spring-fed creek (Ref. 4, p. 21, Appendix A, Figure 2). The spring that feeds this creek is located at the drainage swale discharge point (Ref. 4, p. 21). The probable point of entry (PPE) for hazardous substances released from Sources 1 through 4 is this perennial spring-fed creek (Ref. 60). The spring-fed creek flows approximately 0.33 mile northwest before joining an unnamed perennial tributary to the Tulpehocken Creek. From its confluence with the spring-fed creek, the unnamed tributary flows approximately 1.15 miles north where it then joins the Tulpehocken Creek. The 15-mile downstream TDL is completed in the Tulpehocken Creek, as shown in Figure 10 in the appendix (Ref. 4, p. 21).

Downstream Target Distance Limit

Segment ID	Segment Description	Approximate Segment Length (feet/mile)	Cumulative Length (feet/mile)	Ref.
1	Probable point of entry in spring-fed creek to confluence with unnamed tributary	1,742.4/.33	1,742.4/.33	4, p. 21
2	Unnamed tributary to confluence with Tulpehocken Creek	6,072/1.15	7,814.4/1.48	4, p. 21
3	Tulpehocken Creek	71,385.6/13.52	79,200/15	4, p. 21

4.1.2.1 Likelihood of Release

4.1.2.1.1 Observed Release

Observed releases to the perennial spring-fed creek and the unnamed tributary to the Tulpehocken Creek have been documented by chemical analysis of sediment and surface water samples collected during the 2002 ESI, as discussed below.

Chemical Analysis

EPA's START contractor conducted an ESI at the Ryeland Road Arsenic site in May 2002 (Ref. 4, p. 1). During the ESI, sediment and surface water samples were collected from the spring-fed creek, the spring-fed pond, and the unnamed tributary to the Tulpehocken Creek (Ref. 4, Table 5, pp. 23 and 24). Sediment and surface water sampling locations from the 2002 ESI are shown in Figure 11 in the appendix. Analytical data from the 2002 ESI sampling event supporting an observed release by chemical analysis to the spring-fed creek and the unnamed tributary to the Tulpehocken Creek are presented below.

- Background Sample

The background surface water and sediment samples were collected from the unnamed tributary upstream from its confluence with the spring-fed creek. The background surface water and sediment sampling locations were selected because the unnamed tributary to the Tulpehocken Creek, upstream from its confluence with the spring-fed creek, does not receive surface water runoff from any of the source areas. The background surface water sample was collected from an area that visually appeared to have a similar flow as the release sampling locations (Ref. 59). The background (upstream) sediment sample was of similar grain size (fine) and percent organic matter as the downstream sediment samples (Refs. 23, pp. 45-48 and 52; 59). The background samples were collected during the same sampling event as the release samples, at the same depth (0 to 6 inches bgs), using the same sampling protocols and were analyzed for the same parameters (target analyte list inorganics in accordance with the EPA CLP Statement of Work) (Refs. 4, p. 24; 59).

Sample ID	Sample Location	Matrix	Depth	Date	Reference
RESI-BGSW-01	Unnamed Tributary	Surface Water	Not applicable	05/21/02	4, Table 5, p. 24 and Attachment, p. 30; 23, p. 52
RESI-BGSD-01	Unnamed Tributary	Sediment	0-6 inches	05/21/02	4, Table 5, p. 24 and Attachment, p. 28; 23, p. 52; 59

- **Background Concentration**

The table below provides a summary of the concentrations of hazardous substances detected in the background samples collected from the unnamed tributary to the Tulpehocken Creek during the 2002 ESI. The analytical data package and data validation report from the sampling event are provided in the attachment of Reference 4.

Sample ID	Hazardous Substance	Sample Concentration (µg/L)	CRDL (µg/L)	Reference
Metals				
RESI-BGSW-01	Arsenic	ND	10	4, Attachment, pp. 2-6, 14, and 82
	Copper	ND	25	4, Attachment, pp. 2-6, 14, and 82
	Lead	ND	3	4, Attachment, pp. 2-6, 14, and 82

Sample ID	Hazardous Substance	Sample Concentration (mg/kg)	SQL (mg/kg)	Reference
Metals				
RESI-BGSD-01	Arsenic	1.9K	3.8	4, Attachment, pp. 2-6, 10, and 53; 37
	Copper	20.9	9.5	4, Attachment, pp. 2-6, 10, and 53; 37
	Lead	48.4	1.1	4, Attachment, pp. 2-6, 10, and 53; 37

µg/L Micrograms per liter

CRDL Contract-required detection limit

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

mg/kg Milligrams per kilogram

ND Not detected

SQL Sample quantitation limit (detection limit multiplied by the dilution factor and divided by the percent solids)

- **Release Samples**

All samples meeting the criteria for an observed release to surface water are presented below. Observed release samples were collected from the spring-fed creek and the unnamed tributary to the Tulehocken Creek on the same day as the background samples (Refs. 4, Table 5, pp. 23 and 24; 23, pp. 45-48). The observed release surface water samples were collected in areas that visually appeared to have a similar flow as the background surface water sampling location (Ref. 59). The observed release sediment samples were of similar grain size (fine) and organic matter as the background sediment sample (Refs. 23, pp. 45-48 and 52; 59). The release samples were collected during the same sampling event, at the same depth (0 to 6 inches bgs), using the same sampling protocols and were analyzed for the same parameters (target analyte list inorganics in accordance with the EPA CLP Statement of Work) as the background sample (Refs. 4, p. 24; 59).

Sample ID	Sampling Location	Sampling Date	Reference
RESI-SW-01	Unnamed tributary, approximately 0.567 mile downstream of PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 30; 23, p. 45
RESI-SD-01	Unnamed tributary, approximately 0.567 mile downstream of PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 29; 23, p. 45
RESI-SD-02	Unnamed tributary, approximately 0.414 miles downstream of PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 29; 23, p. 46
RESI-SW-02	Unnamed tributary, approximately 0.359 miles downstream of PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 30; 23, p. 46
RESI-SD-03	Unnamed tributary, approximately 0.359 mile downstream of PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 29; 23, p. 46
RESI-SD-04	Spring-fed creek, approximately 0.157 mile from PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 29; 23, p. 46
RESI-SW-03	Spring-fed creek, approximately 0.06 mile from PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 30; 23, p. 47
RESI-SD-05	Spring-fed creek, approximately 0.06 mile from PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 29; 23, p. 47
RESI-SD-06	Spring-fed creek, approximately 0.035 mile from PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 29; 23, p. 47
RESI-SW-04	Spring-fed creek at PPE	05/21/02	4, Table 5, p. 23 and Attachment, p. 30; 23, p. 48

PPE Probable point of entry

- **Release Concentrations**

The table below provides a summary of the concentrations of hazardous substances detected in the observed release surface water and sediment samples collected from the spring-fed creek and the unnamed tributary to the Tulpehocken Creek. Samples were analyzed in accordance with the EPA CLP Statement of Work (Ref. 4, p. 24). The analytical data package and data validation report are provided in the attachment of Reference 4.

Sample ID	Hazardous Substance	Sample Concentration* (µg/L)	CRDL (µg/L)	Reference
RESI-SW-01	Arsenic	17.3L	10	4, Attachment, p. 14 and 85
RESI-SW-02	Arsenic	23.8L	10	4, Attachment, p. 14 and 86
RESI-SW-03	Arsenic	222	10	4, Attachment, p. 15 and 87
	Lead	5.5L	3	4, Attachment, p. 15 and 87
RESI-SW-04	Arsenic	182	10	4, Attachment, p. 15 and 88
Sample ID	Hazardous Substance	Sample Concentration* (mg/kg)	SQL (mg/kg)	Reference
RESI-SD-01	Arsenic	40.8K (23.4)	3.4	4, Attachment, p. 12 and 64; 37
RESI-SD-02	Arsenic	26.3K (15.1)	2.8	4, Attachment, p. 12 and 65; 37
RESI-SD-03	Arsenic	68.1K (39.1)	4.9	4, Attachment, p. 12 and 66; 37
RESI-SD-04	Arsenic	407K (233.9)	6.1	4, Attachment, p. 12 and 67; 37
	Copper	79	15.2	4, Attachment, p. 12 and 67; 37
	Lead	435	1.8	4, Attachment, p. 12 and 67; 37
RESI-SD-05	Arsenic	146K (83.9)	3.6	4, Attachment, p. 13 and 68; 37
RESI-SD-06	Arsenic	223K (128.2)	2.7	4, Attachment, p. 13 and 69; 37

* All qualified data has been adjusted in accordance with the November 1996 EPA fact sheet entitled "Using Qualified Data to Document an Observed Release or Observed Contamination" (Ref. 30).

µg/L Micogram per liter

() Adjusted value

CRDL Contract-required detection limit

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

L Analyte present. Reported value is biased low. Actual value is expected to be higher.

mg/kg Milligram per kilogram

SQL Sample quantitation limit (detection limit divided by the percent solids)

Attribution:

From 1920 to 1940, the SCWC and subsequently the ACC operated a pesticide, fungicide, paint, and varnish manufacturing plant at the Ryeland Road Arsenic site on the north side of Ryeland Road. As part of the pesticide manufacturing process, arsenic was converted to arsenic acid, which resulted in by-products of lead arsenate, calcium arsenate, and possibly copper acetoarsenate (Ref. 5, p. 1). Reportedly, waste generated during the manufacturing process that consisted of arsenic, copper, and lead compounds was disposed of around the facility property on the north side of Ryeland Road and on a parcel of land located on the south side of Ryeland Road (Ref. 6, p. 8). As documented in Section 2.4.1 of this documentation record, analytical results from soil samples collected during the 2001-2002 EPA removal action and the 2002 ESI indicate the presence of arsenic-, copper-, and lead-contaminated soil. The hazardous substances (arsenic, copper, and lead) detected in the surface water and sediment samples collected from the perennial spring-fed creek and the unnamed tributary to the Tulpehocken Creek at concentrations three times background levels were also detected in soil samples collected from Sources 1, 2, 3, and 4. There is no evidence of a maintained engineered cover or functioning and maintained run-on control system and runoff management system at the source areas.

The area upstream of the background surface water and sediment samples collected from the unnamed tributary of the Tulpehocken Creek, which originates at the spring-fed pond at the Bethany Children's Home, is primarily a forested area (as shown in Figure 1 in the appendix). There is no indication of other potential sources upstream from the site. As shown in Figure 11 in the appendix, samples RESI-SW-06 and RESI-SD-09 were collected from a spring-fed pond that originates on a property used as a plant nursery. Results from the analysis of these samples indicated elevated concentrations of arsenic (Ref. 4, p. 24, Attachment, pp. 15, 26, 91, and 169). This spring-fed pond does not receive overland flow from the source areas; however, it likely receives ground water that flows through and underneath the four source areas. The spring-fed pond flows into the perennial spring-fed creek at sampling locations RESI-SW-03 and RESI-SD-05, as shown in Figure 11 in the appendix. Results of the analysis of these samples also indicated elevated concentrations of arsenic and lead (Ref. 4, Attachment, pp. 13, 15, 68, and 87). PVC piping is used for irrigation at the nursery and, according to the owner, pesticides have never been used at the nursery; therefore, the nursery is not a likely source of the arsenic, copper, and lead concentrations reported in these samples (Ref. 60).

Hazardous Substances Released:

Arsenic

Copper

Lead

4.1.2.3 Drinking Water Targets

There are no drinking water intakes located along the 15-mile TDL; therefore, the drinking water threat was not scored (Ref. 4, p. 22).

SWOF/Food Chain - Toxicity/Persistence/Bioaccumulation

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

the combined toxicity/persistence factor values, human food chain bioaccumulation factor values, and combined toxicity/persistence/bioaccumulation factor values for all hazardous substances associated with a source that has a surface water containment value greater than zero are presented in the table below. Values are based on freshwater. The combined human food chain toxicity/persistence factor values were obtained from HRS Table 4-12 (Ref. 1, Sec. 4.1.3.2.1.4). The combined human food chain toxicity/persistence/bioaccumulation factor values were obtained from HRS Table 4-16 (Ref. 1, Sec. 4.1.3.2.1.4).

Hazardous Substance	Source No.	Toxicity Value	Persistence Value*	Toxicity/Persistence Value	Human Food Chain Bioaccumulation Value2	Toxicity/Persistence/Bioaccumulation/Factor Value	Ref.
Arsenic	1, 2, 3, 4	10,000	1.0	10,000	5.0	5×10^4	2, p. BI-1
Copper	2	NL	1.0	NA	500	NA	2, p. BI-3
Lead	1, 2	10,000	1.0	10,000	5.0	5×10^4	2, p. BI-8

* Persistence value for rivers
 2 Bioaccumulation value for freshwater
 NA Not applicable
 NL Value unknown

Highest Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^4

4.1.3.2.2 Hazardous Waste Quantity

Source hazardous waste quantity values assigned to each source are summarized below.

Source No.	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
1	0.1	No
2	0.92	No
3	0.09	No
4	0.06	No
Sum	1.17	

Hazardous Waste Quantity Factor Value (Ref.1, Table 2-6): 100*

- * As documented in Section 4.1.4.3, targets along the surface water migration pathway are subject to Level II concentrations; therefore, a HWQ value of 100 is assigned for the surface water pathway (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100

SWOF/Food Chain - Waste Characteristic Factor Category Value

4.1.3.2.3 Waste Characteristic Factor Category Value

The waste characteristics factor value for the human food chain threat is calculated by multiplying the HWQ factor value by the toxicity/persistence, and then by the bioaccumulation potential factor value (BPFV) for that hazardous substance (Ref. 1, Section 4.1.3.2.3). The product is assigned a waste characteristic factor category value from HRS Table 2-7 (Ref. 1, Section 2.4.3.1). The values presented below are for arsenic and lead.

HWQ Factor Value: 100

Toxicity/Persistence Factor Value: 10,000

BPFV: 5.0

Toxicity/persistence (10,000) x BPFV (5) x HWQ Factor Value (100): 5×10^6

Waste Characteristics Factor Category Value: 32

4.1.3.3 Human Food Chain Threat Targets

Actual Human Food Chain Contamination

No surface water or sediment samples containing a hazardous substance with a bioaccumulation potential factor value of 500 or greater, have been documented within the boundaries of a fishery.

Closed Fisheries

No closed fisheries can be documented with existing data within the 15-mile downstream TDL.

Level I Concentrations

No Level I fisheries can be documented with existing data within the 15-mile downstream TDL.

Most Distant Level II Sample

No Level II fisheries can be documented with existing data within the 15-mile downstream TDL.

Level II Fisheries

No Level II fisheries can be documented with existing data.

4.1.3.3.1 Food Chain Individual

The unnamed tributary to the Tulpehocken Creek and the Tulpehocken Creek are fisheries (Refs. 61; 62); therefore, a food chain individual factor value of 20 is assigned because there is an observed release of a hazardous substance (copper) having a bioaccumulation factor value of 500 or greater to the watershed (Ref. 1, Section 4.1.3.3.1). The unnamed tributary to the Tulpehocken Creek is a Class A Wild Trout Stream from SR3002 bridge in Womelsdorf downstream to its confluence with the Tulpehocken Creek, approximately 0.8 miles (Ref. 62). The Tulpehocken Creek is an approved trout water beginning one-half mile below the Charming Forge Dam upstream to the Berks County line (Ref. 61). Approximately 3.5 miles of the Tulpehocken Creek fishery lie within the 15-mile downstream TDL. The fisheries are shown on Figure 10 in the appendix.

Food Chain Individual Factor Value: 20

SWOF/Food Chain-Level I and Level II Concentrations

4.1.3.3.2.1 Level I Concentrations

No Level I concentrations can be documented with the available data.

4.1.3.3.2.2 Level II Concentrations

No Level II concentrations can be documented with the available data.

Level I Concentrations Factor Value: 0
Level II Concentrations Factor Value: 0

4.1.3.3.2.3 Potential Human Food Chain Contamination

The unnamed tributary to the Tulpehocken Creek and the Tulpehocken Creek are fisheries (Refs. 61; 62). Production values for these fisheries are not known; therefore, minimum production values were assigned from HRS Table 4-18 (Ref. 1). The average flow rate for the Tulpehocken Creek measured at the Bernville gauge station, located approximately 6 miles downstream from the source areas, as shown in Figure 10 in the appendix, is 78.8 cubic feet per second (ft³/sec) (Ref. 31). A dilution weight of 0.1 was assigned to the Tulpehocken Creek from HRS Table 4-13 (Ref. 1). The flow rate for the unnamed tributary is unknown; therefore, based on the visual observance of flow in this stream, a dilution weight of 0.1 was assigned from HRS Table 4-13 (Refs. 1; 63).

The potential human food chain (PHFC) contamination factor value is calculated as follows:

$$\text{PHFC} = \frac{[(P_1 \times D_1) + (P_2 \times D_2)]}{10}$$

P_1 = Value assigned for human food chain population value from HRS Table 4-18 for Tulpehocken Creek (Ref. 1)

D_1 = Dilution weight assigned from HRS Table 4-13 for Tulpehocken Creek (Ref. 1)

P_2 = Value assigned for human food chain population value from HRS Table 4-18 for the unnamed tributary to the Tulpehocken Creek (Ref. 1)

D_2 = Dilution weight assigned from HRS Table 4-13 for the unnamed tributary to the Tulpehocken Creek (Ref. 1)

$$\text{PHFC} = \frac{[(0.03 \times 0.1) + (0.03 \times 0.1)]}{10} = 0.0006$$

Potential Human Food Chain Contamination Value: 0.0006

4.1.4 Environmental Threat

4.1.4.2 Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

The ecosystem toxicity and persistence values, the environmental bioaccumulation values, and the ecosystem toxicity/persistence/bioaccumulation factor values for all hazardous substances associated with a source that has a surface water containment value greater than zero are presented in the table below. Values are based on freshwater. The combined ecosystem toxicity/persistence/bioaccumulation factor values were obtained from HRS Table 4-21 (Ref. 1, Section. 4.1.4.2.1.4).

Hazardous Substance	Source No.	Ecosystem Toxicity Value	Persistence Value ^a	Ecosystem Toxicity/Persistence Factor Value	Environmental Bioaccumulation Value ^b	Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value	Ref.
Arsenic	1, 2, 3, 4	10	1.0	10	5,000	50,000	2, p. BI-1
Copper	2	1,000	1.0	1,000	5,000	5x10 ⁶	2, p. BI-3
Lead	1, 2	1,000	1.0	1,000	50,000	5x10 ⁷	2, p. BI-8

^a Persistence value for rivers

^b Bioaccumulation value for freshwater

Ecosystem Toxicity/Persistence/Bioaccumulation Potential Factor Value: 5x10⁷

SWOF/Environment - Hazardous Waste Quantity

4.1.4.2.2 Hazardous Waste Quantity

The HWQ values have been assigned to each surface water body that receives runoff from a source.

Source No.	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (Yes/No)
1	0.1	No
2	0.92	No
3	0.09	No
4	0.06	No
Sum	1.17	

Hazardous Waste Quantity Factor Value (Ref.1, Table 2-6): 100*

* As documented in Section 4.1.4.3, targets along the surface water migration pathway are subject to Level II concentrations; therefore, a HWQ value of 100 is assigned for the surface water pathway (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 100

SWOF/Environment - Targets - Level II Concentrations

4.1.4.2.3 Waste Characteristics Factor Category Value

The environmental waste characteristics factor value is obtained by multiplying the ecosystem toxicity/persistence factor value and the HWQ factor value for the watershed and multiplying this product by the ecosystem bioaccumulation potential factor value for that hazardous substance (Ref. 1, Section 4.1.4.2.3). The product is assigned a waste characteristic factor category value from HRS Table 2-7 (Ref. 1, Section 2.4.3.1). The values presented below are for lead.

Ecosystem Toxicity/Persistence Value (1,000) x HWQ Factor Value (100): 1×10^5

Ecosystem Toxicity/Persistence/HWQ (1×10^5) x Ecosystem BPFV (50,000): 5×10^9

Waste Characteristics Factor Category Value: 180

4.1.4.3 Environmental Threat Targets

Level I Concentrations

No Level I concentrations have been documented within the 15-mile downstream TDL.

Most Distant Level II Sample

Chemical analysis of sediment and surface water samples collected from the spring-fed creek and the unnamed tributary to the Tulpehocken Creek document an observed release to the surface water pathway. The hazardous substance arsenic, detected in sediment sample RESI-SD-01 and surface water sample RESI-SW-01 three times or greater above the background concentration, was also detected at all four Sources.

Sample ID: RESI-SD-01
Distance from PPE: 0.567 miles
Reference: 4, Table 5, p. 23; Figure 11 in the appendix

Sample ID: RESI-SW-01
Distance from PPE: 0.567 miles
Reference: 4, Table 5, p. 23; Figure 11 in the appendix

SWOF/Environment - Targets - Level II Concentrations - Wetlands

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.2 Level II Concentrations

In response to an inquiry sent to the U.S. Fish and Wildlife Service (USFWS) regarding endangered and threatened species within the vicinity of the Tulpehocken Creek, the USFWS identified the bog turtle (*Clemmys muhlenbergii*) as being known to occur within the study area.. The bog turtle inhabits shallow spring-fed fens, sphagnum bogs, swamps, and marshy meadows (Ref. 32). Wetland vegetation was observed on the banks of the spring-fed creek and the unnamed tributary to the Tulpehocken Creek during the 2002 ESI sampling event (Refs. 4, Appendix A, Figure 8; 23, pp. 46 and 47). These wetlands were documented to be eligible for evaluation under the HRS and are shown in Figure 11 in the appendix (Ref. 63). As documented in Section 4.1.2.1.1, sediment sample RESI-SD-03 collected from the unnamed tributary to the Tulpehocken Creek, and sediment samples RESI-SD-04 and RESI-SD-05, collected from the spring-fed creek along the frontage of these wetlands, document Level II concentrations of hazardous substances. GPS points were recorded for these samples to delineate the wetland frontage and distances from the PPE to the spring-fed creek and the unnamed tributary (Ref. 42). Distances were measured using the Arcview Version 3.2 computer program (Ref. 13). Sensitive environment and wetland values were assigned from HRS Tables 4-23 and 4-24.

Spring-Fed Creek:

Sensitive Environment	Distance from PPE to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Value
Habitat known to be used by federally designated or proposed endangered or threatened species:			
Bog turtle (<i>Clemmys muhlenbergii</i>)	0 miles	32	75
			TOTAL: 75

SWOF/Environment - Targets - Level II Concentrations - Wetlands

Wetlands

The total length of wetlands documented at the site that are subject to Level II concentrations of hazardous substances is determined by measuring the distance from RESI-SD-05 to RESI-SD-03 (see Figure 11 in the appendix). Wetlands are located along both sides of the spring-fed creek and the unnamed tributary (after confluence with spring-fed creek); therefore, the wetland frontage subject to Level II concentrations is 0.658 miles (Refs. 13; 63). The assigned HRS wetland rating for Level II concentrations is 25 (Ref. 1 Table, 4-24).

Spring-Fed Creek:

Sensitive Environment	Distance from PPE to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Value
Wetland (0.568 miles)	0.054 miles	13; 23, pp. 46 and 47; 63	25
			TOTAL: 25

Unnamed Tributary:

Sensitive Environment	Distance from PPE to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Value
Wetland (0.09 miles)	0.33 miles	13; 23, pp. 46 and 47; 63	0
			TOTAL: 0

Level II Concentrations Factor Value: 100

SWOF/Environment - Targets - Potential Contamination - Wetlands

4.1.4.3.1.3 Potential Contamination

The sensitive environments identified within the 15-mile downstream TDL subject to potential contamination are shown below. Sensitive environment values were assigned from HRS Table 4-23.

Tulpehocken Creek:

Sensitive Environment	Distance from PPE to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Value
State-designated scenic or wild river:			
Tulpehocken Creek	1.48 miles	34	25

TOTAL: 25

Wetlands

HRS-eligible wetlands are documented along the Tulpehocken Creek within the 15-mile downstream TDL, as shown in Figure 10 in the appendix (Ref. 35). The length of these wetlands are provided below.

Tulpehocken Creek

Tulpehocken Creek is a freshwater, small to moderate stream with an average flow rate of 78.8 ft³/sec (Ref. 31). The total length of wetland frontage subject to potential contamination located downstream of the PPE within the TDL is approximately 6.36 miles (Ref. 35). The wetland assigned value is 150 (Ref. 1, Table 4-24).

The potential contamination factor value (SP) is calculated as follows:

$$SP = \frac{(W + S) D}{10}$$

W = Value assigned for wetlands from HRS Table 4-24.

S = Sum of values assigned for the sensitive environment from HRS Table 4-23.

D = Dilution weight assigned from HRS Table 4-13.

$$SP_{Tulpehocken\ Creek} = \frac{(150 + 25) 0.1}{10} = 1.75$$

$$SP_{Total} = 1.75$$

Potential Contamination Factor Value (SP): 1.75

5.0 SOIL EXPOSURE

5.0.1 General Considerations

There are four areas of observed soil contamination, previously discussed in this HRS scoring package as Sources 1 through 4. The four areas of observed contamination, as documented by analytical results, contain concentrations of arsenic, copper, and lead at three times or greater than background levels. The observed contaminated soil was delineated into four distinct areas as a result of numerous EPA removal actions whereby portions of contaminated soil have been excavated and removed from the site leaving noncontiguous areas of observed soil contamination, as shown in Figure 3 (as Areas A through D) in the appendix.

Chemical Analysis:**- Background Sample**

EPA START collected five soil samples during the 2002 ESI to document background soil conditions in the area. The background soil samples were taken from locations outside the influence of the site, as shown in Figure 3 in the appendix. Arsenic concentrations detected in the ESI background samples ranged from 3.3 to 6.7 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). According to published data, the observed range of arsenic concentrations in the eastern United States is from <0.1 to 73 mg/kg with an estimated mean of 7.4 mg/kg (Ref. 40, p. 10). Copper concentrations detected in the ESI background samples ranged from 5.1 to 51 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). The observed range of copper concentrations in the eastern United States is from <1 to 700 mg/kg with an estimated mean of 22 (Ref. 40, p. 10). Lead concentrations detected in the ESI background samples ranged from 6.4 to 156 mg/kg (Ref. 4, Attachment, pp. 10, 11, and 54-58). The observed range of lead concentrations in the eastern United States is from <10 to 300 mg/kg with an estimated mean of 17 mg/kg (Ref. 40, p. 10). The background samples containing the highest concentrations for arsenic, copper, and lead, RESI-BGSS-05 for arsenic and RESI-BGSS-04 for copper and lead, were used to determine the significance of the concentrations of these metals detected in the area of observed contamination samples (Ref. 4, Attachment, pp. 10, 11, 57 and 58). The ESI background sampling locations are shown in Figure 3 in the appendix. The samples were analyzed according to EPA CLP protocols (Ref 4, p. 11).

Sample ID	Depth (inches)	Date Sampled	Reference
RESI-BGSS-04	0-6	05/21/02	4, Attachment p. 10 and 57; 23, p. 51
RESI-BGSS-05	18-24	05/21/02	4, Attachment p. 11 and 58; 23, p. 51

- Background Concentrations

Sample ID	Hazardous Substance	Concentration (mg/kg)	SQL (mg/kg)	Reference
RESI-BGSS-04	Copper	59	6.31	4, Attachment, p. 10 and 57
	Lead	156	0.76	4, Attachment, p. 10 and 57
RESI-BGSS-05	Arsenic	6.7K	2.43	4, Attachment, p. 11 and 58

K Analyte present. Reported value may be biased high. Actual value expected to be lower.

mg/kg Milligrams per kilograms

SQL Sample quantitation limit (detection limit divided by the percent solids)

SE - Area of Observed Contamination
Area A

Area of Observed Contamination: Area A

Name and description of the area: Contaminated Soil/West of Former Pesticide Facility

Area A is a 2,275-ft² area of contaminated soil (Ref. 13). The boundaries of Area A are defined by the elevated concentrations of arsenic and lead detected in soil samples collected during the 2001-2002 EPA removal action. Each soil sampling location was recorded using GPS (Ref. 42). The GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background were then plotted into the Arcview 3.2 computer program and are shown in Figure 12 in the appendix. The area of Area A was calculated using the Arcview 3.2 program by determining the area within the boundary of the connected sampling points (Ref. 13).

Location of the area, with a reference to a map of the site

Area A is located on two parcels of land on the north side of Ryeland Road, west of the former pesticide facility as shown in Figure 12 in the appendix (Ref. 4, Appendix A, Figure 2). A portion of Area A is located on a residential property, and within 200 feet of the residence on that property, as shown in Figure 12 in the appendix. The eastern boundary of Area A is defined by the extent of the contaminated soil removed during the 2002 EPA removal action (Ref. 4, Appendix A, Figure 3).

SE - Area of Observed Contamination
Area A

- Contaminated Samples - Area A

Sample ID	Depth (inches)	Date	Reference
RR-SS-81	0-12	06/5/02	8, Logbook 1, p. 125; 10, p. 000001.
RR-SS-93	0-6	06/18/02	8, Logbook 2, p. 4; 12, p. 0008
RR-SS-181	0-6	08/14/02	8, Logbook 2, p. 124; 39, p. 4

**SE - Area of Observed Contamination
Area A**

- Concentrations - Area A

Sample ID	Hazardous Substance	Sample Concentration* (mg/kg)	RLs/ Detection Limit** (mg/kg)	Reference
RR-SS-81	Arsenic	42.2J (24.2)	0.583	9; 10, p. 2
RR-SS-93	Lead	870	2	11; 12, p. 0004 and 0015
RR-S-181	Arsenic	22	2	38; 39, p. 12

* All qualified data has been adjusted in accordance with the November 1996 EPA fact sheet entitled "Using Qualified Data to Document an Observed Release or Observed Contamination" (Ref. 30).

** The laboratory adjusted the data for percent solids to determine the method detection limit/reporting limit; therefore, the laboratory method detection limit/reporting limit is equivalent to the sample quantitation limit (Refs. 10; 12; 39).

() Adjusted value

J Analyte present. Reported value may not be accurate or precise. The direction of the bias, high or low, cannot be determined. Data qualified because criteria for serial dilution and matrix spike recoveries were not met.

mg/kg Milligrams per kilogram

RLs Laboratory reporting limit

SE - Area of Observed Contamination
Area B

Area of Observed Contamination: Area B

Name and description of the area: Contaminated Soil/Former Pesticide Facility

Area B is a 31,389-ft² area of contaminated soil (Ref. 13). Analytical results from soil samples collected during the 2001-2002 EPA removal action and the 2002 ESI sampling event were used to delineate the boundaries of Area B. These results indicated elevated concentrations of arsenic, copper, and lead at Area B. Each soil sample location was recorded using GPS coordinates (Refs. 8, Logbook 3, pp. 17 and 18; 42). The GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background were plotted in the Arcview 3.2 computer program, as shown in Figure 13 in the appendix. The area of Area B was calculated by the Arcview 3.2 program by determining the area within the boundary of the connected sampling points. To calculate the most conservative estimate for the area of observed contamination for Area B, J-qualified data was used. If J qualified data is removed from consideration, the area of observed contamination becomes larger.

Location of the area, with reference to a map of the site:

Area B is located on the north side of Ryeland Road in the area formerly occupied by the pesticide facility, three residential homes are located within 200 feet of Area B, as shown in Figure 13 in the appendix (Ref. 4, Appendix A, Figure 2).

**SE - Area of Observed Contamination
Area B**

- Contaminated Samples - Area B

Sample ID	Depth (inches)	Date	Reference
RESI-SS-29	0-6	05/20/02	4, Attachment, p. 34; 23, p. 32
RESI-SS-33	18-24	05/21/02	4, Attachment, p. 34; 23, p. 40
RESI-SS-37	18-24	05/21/02	4, Attachment, p. 35; 23, pp. 40, 41
RESI-SS-41	18-24	05/21/02	4, Attachment, p. 35; 23, p. 42
RESI-SS-45	18-24	05/21/02	4, Attachment, p. 35; 23, p. 43
RESI-SS-46	0-6	05/21/02	4, Attachment, p. 35; 23, p. 43
RESI-SS-47	0-6	05/21/02	4, Attachment, p. 36; 23, p. 44
RESI-SS-49	0-6	05/21/02	4, Attachment, p. 36; 23, p. 44
RESI-DSS-03	0-6	05/22/02	4, Attachment, p. 28; 23, p. 53
RESI-DSS-04	0-6	05/22/02	4, Attachment, p. 28; 23, p. 54
RR-SS-208	0-6	08/27/02	8, Logbook 3, p. 11-12; 15, p. 4
RR-SS-209	0-6	08/27/02	8, Logbook 3, p. 11-12; 15, p. 4
RR-SS-210	0-6	08/27/02	8, Logbook 3, p. 11-12; 15, p. 4
RR-SS-212	0-6	08/27/02	8, Logbook 3, p. 12; 15, p. 4
RR-SS-216	0-6	08/27/02	8, Logbook 3, p. 12; 15, p. 4
RR-SS-217	0-6	08/27/02	8, Logbook 3, p. 12; 15, p. 4
RR-SS-219	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-220	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-221	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-222	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-223	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-224	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-225	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-226	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-227	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-228	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4

**SE - Area of Observed Contamination
Area B**

Sample ID	Depth (inches)	Date	Reference
RR-SS-229	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-230	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-231	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-232	0-6	08/28/02	8, Logbook 3, p. 16-17; 17, p. 4
RR-SS-233	0-6	08/28/02	8, Logbook 3, p. 17; 17, p. 4
RR-SS-234	0-6	08/28/02	8, Logbook 3, p. 17; 17, p. 5
RR-SS-235	0-6	08/28/02	8, Logbook 3, p. 17; 17, p. 5
RR-SS-237	0-6	08/28/02	8, Logbook 3, p. 17; 17, p. 5

**SE - Area of Observed Contamination
Area B**

- Concentrations - Area B

Sample ID	Hazardous Substance	Sample Concentration* (mg/kg)	SQL/ Reporting Limit** (mg/kg)	Reference
RESI-SS-29	Arsenic	76.3K (43.8)	2.6	4, Attachment, pp. 21 and 136; 37
RESI-SS-33	Arsenic	11,300K (6,494.2)	2.4	4, Attachment, pp. 22 and 140; 37
	Copper	467J (382.8)	5.9	4, Attachment, pp. 22 and 140; 37
	Lead	7,420	0.71	4, Attachment, pp. 22 and 140; 37
RESI-SS-37	Arsenic	589K (338.5)	2.3	4, Attachment, pp. 23 and 144; 37
RESI-SS-41	Arsenic	59K (33.9)	2.3	4, Attachment, pp. 23 and 148; 37
RESI-SS-45	Arsenic	102	2.4	4, Attachment, pp. 24 and 161
RESI-SS-46	Arsenic	268	2.6	4, Attachment, pp. 24 and 162; 37
RESI-SS-47	Arsenic	78.2	2.4	4, Attachment, pp. 25 and 163; 37
RESI-SS-49	Arsenic	59.1	2.6	4, Attachment, pp. 25 and 165; 37
RESI-DSS-03	Arsenic	81.5K (46.8)	2.7	4, Attachment, pp. 11 and 61; 37
RESI-DSS-04	Arsenic	82.4K (47.4)	3.4	4, Attachment, pp. 11 and 62; 37
RR-SS-208	Arsenic	59J (33.9)	1	14; 15, p. 0006
RR-SS-209	Arsenic	63J (36.2)	0.9	14; 15, p. 0008
RR-SS-210	Arsenic	51J (29.3)	0.9	14; 15, p. 0010
RR-SS-212	Arsenic	62J (35.6)	1	14; 15, p. 0014
RR-SS-216	Arsenic	43J (24.7)	1	14; 15, p. 0022
RR-SS-217	Arsenic	55J (31.6)	0.9	14; 15, p. 0024
RR-SS-219	Arsenic	79	1	16; 17, p. 0009
RR-SS-220	Arsenic	100	1	16; 17, p. 0011
RR-SS-221	Arsenic	62	1	16; 17, p. 0013
RR-SS-222	Arsenic	220	0.9	16; 17, p. 0015
RR-SS-223	Arsenic	220	0.9	16; 17, p. 0017
RR-SS-224	Arsenic	150	0.9	16; 17, p. 0019
RR-SS-225	Arsenic	120	0.9	16; 17, p. 0021
RR-SS-226	Arsenic	280	1	16; 17, p. 0023

**SE - Area of Observed Contamination
Area B**

Sample ID	Hazardous Substance	Sample Concentration* (mg/kg)	SQL/ Reporting Limit** (mg/kg)	Reference
RR-SS-227	Arsenic	95	0.8	16; 17, p. 0025
RR-SS-228	Arsenic	71	0.8	16; 17, p. 0027
RR-SS-229	Arsenic	90	1	16; 17, p. 0029
RR-SS-230	Arsenic	40	1	16; 17, p. 0031
RR-SS-231	Arsenic	75	0.9	16; 17, p. 0033
RR-SS-232	Arsenic	150	0.9	16; 17, p. 0035
RR-SS-233	Arsenic	120	0.8	16; 17, p. 0037
RR-SS-234	Arsenic	54	0.9	16; 17, p. 0039
RR-SS-235	Arsenic	35	0.9	16; 17, p. 0041
RR-SS-237	Arsenic	27	0.9	16; 17, p. 0045

* All qualified data has been adjusted in accordance with the November 1996 EPA fact sheet entitled "Using Qualified Data to Document an Observed Release or Observed Contamination" (Ref. 30).

** For samples analyzed by a non-CLP laboratory, the laboratory adjusted the data for percent solids to determine the reporting limit; therefore, the laboratory reporting limit is equivalent to the SQL (Refs. 15; 17).

() Adjusted value

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

mg/kg Milligrams per kilogram

SE - Area of Observed Contamination
Area C

Area of Observed Contamination: Area C

Name and Description of the area: Contaminated Soil/Western Edge of Former Pesticide Facility Disposal Area

Area C is a 3,014-ft² area of contaminated soil (Ref. 13). The boundaries of Area C are defined by the elevated concentrations of arsenic and lead detected in soil samples collected during the 2001-2002 EPA removal action. Each soil sampling location was recorded using GPS coordinates (Ref. 8, Logbook ,1 p. 59; 42). The GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background levels were plotted into the Arcview 3.2 computer program and are shown in Figure 14 in the appendix. The area of Area C was calculated by the Arcview 3.2 program by determining the area within the boundary of the connected sampling points (Ref. 13).

Location of the area, with reference to a map of the site:

Area C is located on the south side of Ryeland Road in the area formerly used by the pesticide manufacturing facility as a disposal area and extends to the west onto a residential property, as shown in Figure 14 in the appendix (Refs. 4, Appendix A, Figure 2; 6, p. 8). A drainage ditch flows through the center of the area of observed contamination, north to the property formerly occupied by the pesticide facility, also shown in Figure 14 in the appendix.

**SE - Area of Observed Contamination
Area C**

- Contaminated Samples - Area C

Sample ID	Depth (inches)	Date	Reference
RR-S-078A	0-8	08/09/01	8, Logbook 1, p. 59; 18, p. 82
RR-S-079A	0-6	08/09/01	8, Logbook 1, p. 59; 18, p. 82
RR-S-082	0-12	09/10/01	8, Logbook 1, p. 63; 18, p. 85
RR-S-084	0-8	09/10/01	8, Logbook 1, p. 63; 18, p. 85
RR-S-085	0-8	09/10/01	8, Logbook 1, p. 64; 18, p. 85
RR-S-087	0-8	09/10/01	8, Logbook 1, p. 64; 18, p. 85
RR-S-109	0-12	09/10/01	8, Logbook 1, p. 68; 18, p. 83

SE - Area of Observed Contamination
Area C

– **Concentrations - Area C**

Sample ID	Hazardous Substances	Sample Concentration (mg/kg)	MDL* (mg/kg)	Reference
RR-S-078A	Arsenic	540	7.5	18, pp. 1-5 and 25
RR-S-079A	Arsenic	560	7.5	18, pp. 1-5 and 25
RR-S-082	Arsenic	2,400	9.2	18, pp. 1-5 and 28
RR-S-084	Arsenic	70	8.8	18, pp. 1-5 and 29
RR-S-085	Arsenic	220	8.1	18, pp. 1-5 and 29
RR-S-087	Arsenic	55	7.8	18, pp. 1-5 and 29
RR-S-109	Arsenic	110	8.6	18, pp. 1-5 and 28

* The laboratory adjusted the data for percent solids to determine the method detection limit; therefore, the laboratory method detection limit is equivalent to the sample quantitation limit (Ref. 18, p. 11).

MDL Method detection limit
mg/kg Milligrams per kilogram

SE - Area of Observed Contamination
Area D

Area of Observed Contamination: Area D

Name and description of the area: Contaminated Soil/Eastern Edge of Former Pesticide Facility Disposal Area

Area D is a 1,876 ft² area of contaminated soil (Ref. 13). The boundaries of Area D are defined by the elevated concentrations of arsenic and lead detected in the soil samples collected during the 2001-2002 EPA removal action. Each soil sampling location was recorded using GPS coordinates (Refs. 8 Logbook 1, pp. 57-59; 42). The GPS coordinates of the sampling points that had concentrations of hazardous substances attributable to the site three times or greater than background levels were then plotted into the Arcview 3.2 computer program and are shown in Figure 15 in the appendix. The area of Area D was calculated by the Arcview 3.2 program by determining the area within the boundary of the connected sampling points (Ref. 13)

Location of the area, with reference to a map of the site:

Area D is located on the south side of Ryeland Road on the property formerly used by the pesticide facility as a disposal area (Refs. 4, Appendix A, Figure 2; 6, p. 8). Area D extends onto a residential property east of the former disposal area within 200 feet of the residence on that property, as shown in Figure 15 in the appendix.

**SE - Area of Observed Contamination
Area D**

- Contaminated Samples - Area D

Sample ID	Depth (inches)	Date	Reference
RR-S-072A	0-6	08/09/01	8, Logbook 1, p. 57; 18, p. 82
RR-S-073A	0-6	08/09/01	8, Logbook 1, p. 58; 18, p. 82
RR-S-074A	0-6	08/09/01	8, Logbook 1, p. 58; 18, p. 82
RR-S-077A	Surface scrape	08/09/01	8, Logbook 1, p. 58; 18, p. 82
RR-S-094	0-10	09/10/01	8, Logbook 1, p. 65; 18, p. 85
RR-S-095	0-6	09/10/01	8, Logbook 1, p. 65; 18, p. 84
RR-SS-190	0-6	08/16/02	8, Logbook 2, p. 130; 20, p. 4

**SE - Area of Observed Contamination
Area D**

– Concentrations - Area D

Sample ID	Hazardous Substance	Concentration (mg/kg)	MDL* (mg/kg)	Reference
RR-S-072A	Arsenic	190	7.7	18, pp. 1-5 and 24
RR-S-073A	Arsenic	360	7.5	18, pp. 1-5 and 24
RR-S-074A	Arsenic	120	7.7	18, pp. 1-5 and 24
RR-S-077A	Arsenic	22	0.98	18, pp. 1-5 and 25
RR-S-094	Arsenic	240	7.8	18, pp. 1-5 and 30
RR-S-095	Arsenic	100	7.8	18, pp. 1-5 and 30
RR-SS-190	Arsenic	42	0.9	19; 20, p. 0017

* The laboratory adjusted the data for percent solids to determine the method detection limit/reporting limit; therefore, the laboratory method detection limit/reporting limit is equivalent to the sample quantitation limit (Ref. 18, p. 11; Ref. 20).

mg/kg Milligrams per kilogram

MDL Method detection limit

Attribution:

From 1920 to 1940 the SCWC and subsequently the ACC operated a pesticide, fungicide, paint, and varnish manufacturing plant at the Ryeland Road Arsenic site on the north side of Ryeland Road. As part of the pesticide manufacturing process, arsenic was converted to arsenic acid, which resulted in by-products of lead arsenate, calcium arsenate, and possibly copper acetoarsenate (Ref. 5, p. 1). Reportedly, waste generated during the manufacturing process that consisted of arsenic, copper, and lead was disposed of around the facility property on the north side of Ryeland Road and on a parcel of land located on the south side of Ryeland Road (Ref. 6, p. 8). Analytical results from soil samples collected during the 2001-2002 EPA removal action and the 2002 ESI indicate the presence of arsenic-, copper-, and lead-contaminated soil. The area upgradient of the site is mostly undeveloped, as shown in Figure 1 in the appendix. No other potential sources for the contaminated soil have been identified at this time.

Hazardous Substances:

Arsenic

Copper

Lead

SE - Characterization of Area of Observed Contamination - Area A

Hazardous Waste Quantity - Area A

Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Area A.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

Hazardous Waste Stream Quantity

<u>Hazardous Waste Stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous waste stream for Area A.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

Volume

The information available is not sufficient to adequately evaluate the volume for Area A.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

Area

Area A is approximately 2,275 ft² and is delineated by analytical results of soil samples collected during the 2002 EPA removal action(Ref. 13). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points with concentrations of hazardous substances three times or greater than background levels into the Arcview 3.2 computer program. The area of Area A was calculated using the Arcview 3.2 program from the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt. Area A is shown in Figure 12 in the appendix.

Area of Source (ft²): 2,275

Area Assigned Value (Ref. 1, Table 2-5): 2,275/34,000 = 0.07

SE - Characterization of Area of Observed Contamination - Area B

Hazardous Waste Quantity - Area B

Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Area B.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

Hazardous Waste Stream Quantity

<u>Hazardous Waste Stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous waste stream quantity for Area B.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

Volume

The information available is not sufficient to adequately evaluate the volume of contaminated soils for Area B.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

Area

Area B is approximately 31,389-ft² and is delineated by the analytical results of the soil samples collected during the 2002 EPA removal actions and the 2002 ESI (Ref. 13). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points with concentrations of hazardous substances three times or greater than background levels into the Arcview 3.2 computer program. The area was then calculated using the Arcview 3.2 program from the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt. Area B is shown in Figure 13 in the appendix.

Area of source (ft²): 31,389

Area Assigned Value (Ref. 1, Table 2-5): 31,389/34,000 = 0.92

SE - Characterization of Area of Observed Contamination - Area C

Hazardous Waste Quantity - Area C

Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Area C.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

Hazardous Waste Stream Quantity

<u>Hazardous Waste Stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous waste stream quantity for Area C.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

Volume

The information available is not sufficient to adequately evaluate the volume for Area C.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

Area

Area C is approximately 3,014 ft² and is delineated by the analytical results of soil samples collected during the 2001 EPA removal action (Ref. 13). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points with concentrations of hazardous substances three times or greater than background levels into the Arcview 3.2 computer program. The area was then calculated using the Arcview 3.2 program from the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt. Area C is shown in Figure 14 in the appendix.

Area of Source (ft²): 3,014

Area Assigned Value (Ref. 1, Table 2-5): 3,014/34,000 = 0.09

SE - Characterization of Area of Observed Contamination - Area D

Hazardous Waste Quantity - Area D

Hazardous Constituent Quantity

<u>Hazardous Substance</u>	<u>Constituent Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous constituent quantity for Area D.

Sum (pounds): Unknown

Hazardous Constituent Quantity Value (C): NA

Hazardous Waste Stream Quantity

<u>Hazardous Waste Stream</u>	<u>Quantity (pounds)</u>	<u>Reference</u>
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The information available is not sufficient to adequately evaluate the hazardous waste stream quantity for Area D.

Sum (pounds): Unknown

Hazardous Waste Stream Quantity Value: NA

Volume

Information available is not sufficient to adequately evaluate the volume for Area D.

Dimension of Source (yd³ or gallons): Unknown

Volume Assigned Value: NA

Area

Area D is approximately 1,876 ft² and is delineated by the analytical results of the soil samples collected during the 2001 EPA removal action (Ref. 13). The area of the delineated contaminated soil was calculated by plotting the GPS coordinates of the sampling points with concentrations of hazardous substances three times or greater than background levels into the Arcview 3.2 computer program. The area was then calculated using the Arcview 3.2 program from the area within the boundary of the connected sampling points, minus any area covered by impervious surfaces such as asphalt. Area D is shown in Figure 15 in the appendix.

Area of source (ft²): 1,876

Area Assigned Value (Ref. 1, Table 2-5): 1,876/34,000 = 0.06

SE - Level of Contamination

Summary of Site Contamination

– Level I Samples

The following table presents surface soil samples with concentrations of arsenic exceeding EPA's risk-based concentration (RBC) of 0.43 mg/kg; therefore, these samples meet the criteria for Level I samples (Ref. 2, p. BII-14).

Sample ID	Sample Date	Hazardous Substance	Sample Concentration* (mg/kg)	RBC (mg/kg)	Reference
RR-SS-81	06/05/02	Arsenic	42.2J (24.2)	0.43	9; 10, p. 2
RR-SS-181	08/14/02	Arsenic	22	0.43	38; 39, p. 12
RESI-SS-29	05/20/02	Arsenic	76.3K (43.8)	0.43	4, Attachment, pp. 21 and 136
RESI-SS-33	05/21/02	Arsenic	11,300K (6,494.2)	0.43	4, Attachment, pp. 22 and 140
RESI-SS-37	05/21/02	Arsenic	589K (338.5)	0.43	4, Attachment, pp. 23 and 144
RESI-SS-41	05/21/02	Arsenic	59K (33.9)	0.43	4, Attachment, pp. 23 and 148
RESI-SS-45	05/21/02	Arsenic	102	0.43	4, Attachment, pp. 24 and 161
RESI-SS-46	05/21/02	Arsenic	268	0.43	4, Attachment, pp. 24 and 162
RESI-SS-47	05/21/02	Arsenic	78.2	0.43	4, Attachment, pp. 25 and 163
RESI-SS-49	05/21/02	Arsenic	59.1	0.43	4, Attachment, pp. 25 and 165
RESI-DSS-03	05/22/02	Arsenic	81.5K (46.8)	0.43	4, Attachment, pp. 11 and 61
RESI-DSS-04	05/22/02	Arsenic	82.4K (47.4)	0.43	4, Attachment, pp. 11 and 62
RR-SS-208	08/27/02	Arsenic	59J (33.9)	0.43	14; 15, p. 0006
RR-SS-209	08/27/02	Arsenic	63J (36.2)	0.43	14; 15, p. 0008
RR-SS-210	08/27/02	Arsenic	51J (29.3)	0.43	14; 15, p. 0010
RR-SS-212	08/27/02	Arsenic	62J (35.6)	0.43	14; 15, p. 0014
RR-SS-216	08/27/02	Arsenic	43J (24.7)	0.43	14; 15, p. 0022
RR-SS-217	08/27/02	Arsenic	55J (31.6)	0.43	14; 15, p. 0024
RR-SS-219	08/28/02	Arsenic	79	0.43	16; 17, p. 0009
RR-SS-220	08/28/02	Arsenic	100	0.43	16; 17, p. 0011
RR-SS-221	08/28/02	Arsenic	62	0.43	16; 17, p. 0013
RR-SS-222	08/28/02	Arsenic	220	0.43	16; 17, p. 0015
RR-SS-223	08/28/02	Arsenic	220	0.43	16; 17, p. 0017
RR-SS-224	08/28/02	Arsenic	150	0.43	16; 17, p. 0019

SE - Level of Contamination

Sample ID	Sample Date	Hazardous Substance	Sample Concentration* (mg/kg)	RBC (mg/kg)	Reference
RR-SS-225	08/28/02	Arsenic	120	0.43	16; 17, p. 0021
RR-SS-226	08/28/02	Arsenic	280	0.43	16; 17, p. 0023
RR-SS-227	08/28/02	Arsenic	95	0.43	16; 17, p. 0025
RR-SS-228	08/28/02	Arsenic	71	0.43	16; 17, p. 0027
RR-SS-229	08/28/02	Arsenic	90	0.43	16; 17, p. 0029
RR-SS-230	08/28/02	Arsenic	40	0.43	16; 17, p. 0031
RR-SS-231	08/28/02	Arsenic	75	0.43	16; 17, p. 0033
RR-SS-232	08/28/02	Arsenic	150	0.43	16; 17, p. 0035
RR-SS-233	08/28/02	Arsenic	120	0.43	16; 17, p. 0037
RR-SS-234	08/28/02	Arsenic	54	0.43	16; 17, p. 0039
RR-SS-235	08/28/02	Arsenic	35	0.43	16; 17, p. 0041
RR-SS-237	08/28/02	Arsenic	27	0.43	16; 17, p. 0045
RR-S-078A	08/09/01	Arsenic	540	0.43	18, p. 25
RR-S-079A	08/09/01	Arsenic	560	0.43	18, p. 25
RR-S-082	09/10/01	Arsenic	2,400	0.43	18, p. 28
RR-S-084	09/10/01	Arsenic	70	0.43	18, p. 29
RR-S-085	09/10/01	Arsenic	220	0.43	18, p. 29
RR-S-087	09/10/01	Arsenic	55	0.43	18, p. 29
RR-S-109	09/10/01	Arsenic	110	0.43	18, p. 28
RR-S-072A	08/09/01	Arsenic	190	0.43	18, p. 24
RR-S-073A	08/09/01	Arsenic	360	0.43	18, p. 24
RR-S-074A	08/09/01	Arsenic	120	0.43	18, p. 24
RR-S-077A	08/09/01	Arsenic	22	0.43	18, p. 25
RR-S-094	09/10/01	Arsenic	240	0.43	18, p. 30
RR-S-095	09/10/01	Arsenic	100	0.43	18, p. 30
RR-SS-190	08/16/01	Arsenic	42	0.43	19; 20, p. 0017

* All qualified data has been adjusted in accordance with the November 1996 EPA fact sheet entitled "Using Qualified Data to Document an Observed Release or Observed Contamination" (Ref. 30).

() Adjusted value

J Analyte present. Reported value may not be accurate or precise.

K Analyte present. Reported value is biased high. Actual value is expected to be lower.

mg/kg Milligrams per kilogram

SE - Level of Contamination

– Level II Samples

The following table presents surface soil samples from areas of observed contamination that meet the criteria for Level II samples.

Sample ID	Sample Date	Hazardous Substance	Sample Concentration (mg/kg)	Reference
RR-SS-93	06/18/02	Lead	870	11; 12, pp. 0004 and 0015

mg/kg Milligrams per kilogram

5.1 RESIDENT POPULATION THREAT

Three of the four areas of documented soil contamination are within 200 feet and on the property of an occupied residence, as shown in the table below and in Figures 12 through 15 in the appendix.

<u>Sample ID/Area of Observed Contamination</u>	<u>Distance from Population to Observed Contamination (feet)</u>
RR-SS-181/Area A	< 10
RESI-SS-37/Area B	50
RR-SS-227/Area B	< 10
RR-SS-216/Area B	70
RR-SS-190/Area D	50

5.1.1 Likelihood of Exposure

As documented above, there is observed contamination located within 200 feet and on the property of residences; therefore, the likelihood of exposure factor for the resident population threat is assigned a value of 550 (Ref. 1).

Resident Population Threat Likelihood of Exposure Category Value: 550

5.1.2 Waste Characteristics**5.1.2.1 Toxicity**

Presented below are the toxicity values of hazardous substances for which observed contamination has been documented in Section 5.1. A toxicity factor value was assigned for each hazardous substance as specified in Section 2.4.1.1.

Hazardous Substance	Area of Contamination	Toxicity Value	Ref.
Arsenic	A, B, C, D	10,000	2, p. BI-1
Copper	B	NL	2, p. BI-3
Lead	A, B	10,000	2, p. BI-8

NL Value unknown

Highest Toxicity Value: 10,000

SE - Resident Population - Hazardous Waste Quantity**5.1.2.2 Hazardous Waste Quantity****SUMMARY OF AREAS EVALUATED**

Area	Area of Contamination Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Area of Contamination Hazardous Constituent Quantity Data Complete? (Yes/No)
A	0.07	No
B	0.92	No
C	0.09	No
D	0.06	No
Sum	1.14	

Hazardous Waste Quantity Factor Value (Ref.1, Table 2-6): 10

SE - Waste Characteristic Factor Category Value

5.1.2.3 Waste Characteristic Factor Category Value

The waste characteristics factor value for the soil exposure pathway is calculated below, as specified in the HRS Final Rule (Ref. 1, Section 5.1.2.3)

Toxicity: 10,000

HWQ Factor Value: 10

Toxicity (10,000) x HWQ Factor Value (100): 1×10^5

Waste Characteristics Factor Category Value: 18
(Ref. 1, Table 2-7)

SE - Resident Population - Targets - Resident Individual

5.1.3 Targets

5.1.3.1 Resident Individual

As shown in Figures 12, 13, and 15 in the appendix, Level I samples within three of the four areas of contamination (Areas A, B, and D) are located within 200 feet of a residence and on the same property as the residence; therefore, a value of 50 was assigned for the resident individual (Ref. 1, Section 5.1.3.1).

Resident Individual Value: 50

SE - Resident Population - Level I**5.1.3.2 Resident Population****5.1.3.2.1 Level I Concentrations**

Area	Population	Reference
Area A	4	8, Logbook 2, pp. 4, 123, and 124; 23, p. 56
Area B	6	8, Logbook 3, pp. 11-12 and 16-17; 23, pp. 32, 40-44, 53-54, and 56
Area D	2	8, Logbook 2, p. 130; 23, p. 56
Total Level I Population	12	

Sum of Level I Resident Population x 10 (Ref. 1, Section 5.1.3.2.1): 120

Level I Resident Population Factor Value: 120

SE - Resident Population - Level II

5.1.3.2.2 Level II Concentrations

There are no Level II concentrations located within 200 feet of identified areas of contamination.

Level II Resident Population Factor Value: 0

5.1.3.3 Workers

There are no workers on properties located within 200 feet of identified areas of contamination.

Worker Factor Value: 0

5.1.3.4 Resources

No resources have been identified on areas of observed contamination.

=====

Resource Factor Value: 0

SE - Resident Population - Terrestrial Sensitive Environments

5.1.3.5 Terrestrial Sensitive Environments

No terrestrial sensitive environments have been identified on areas of observed contamination.

Terrestrial Sensitive Environment Factor Value: 0